THE IRON AGE

UNIV. OF MICH.

New York, December 26, 1918

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PITTSBURGH, PA.

THE IRON AGE

New York, December 26, 1918

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Unique Features of an Illinois Foundry

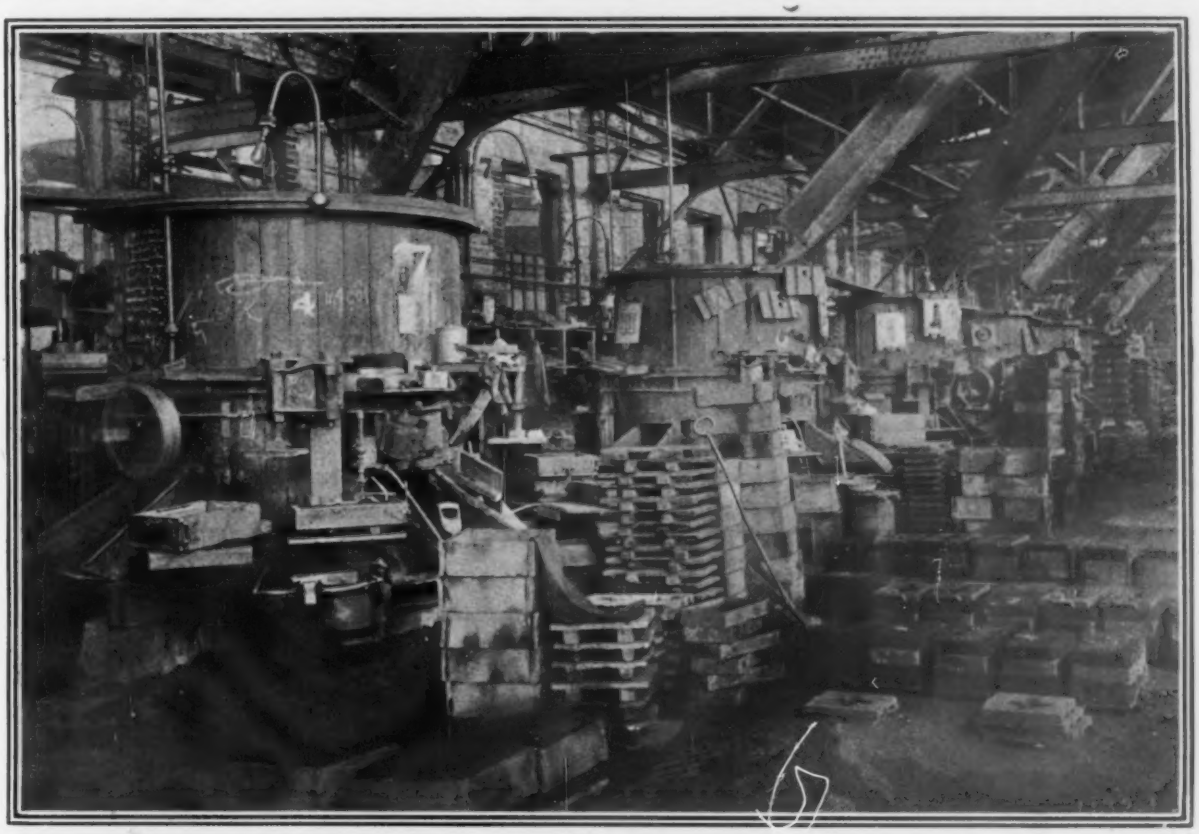
Electric Steel, Gray Iron and Semi-Steel Departments—Continuous Operations with Large Production in Small Space—Use of Molding Machines

BY CHARLES LUNDBERG

RELATIVELY the foundry of the Avery Co., Peoria, Ill., is new. Its departments produce gray-iron, semi-steel and electric steel castings. The principal departments are of the continuous type, metal being poured from 7.30 to 4.30 p. m., with 70 per cent of the castings coming from machine-made molds. This foundry possesses many features peculiar to itself, several of them having been evolved by W. J. Brandon, mechanical engineer and works manager of the Avery Co. Built from a base which was the old Kingman Plow Co.'s plant, the new foundry may be regarded as an evolution, inasmuch as many changes and experiments preceded completion.

The unusual features of the plant embrace a system of keeping molding sand in large wooden tanks which are automatically filled, an arrangement called the "circle," which enables the making and pouring of over 320 molds a day in an area of approximately 6400 sq. ft. (80 x 80 ft.); a separate building housing four cupolas which dump into a basement, the working over of all molding sand in a basement beneath the main molding floor, thence elevated by bucket conveyors; the extensive use of jib-type cranes equipped with electric hoists, and the free use of small trucks or cars running on fixed tracks for the easy shifting of flasks and their assembly at designated points for pouring.

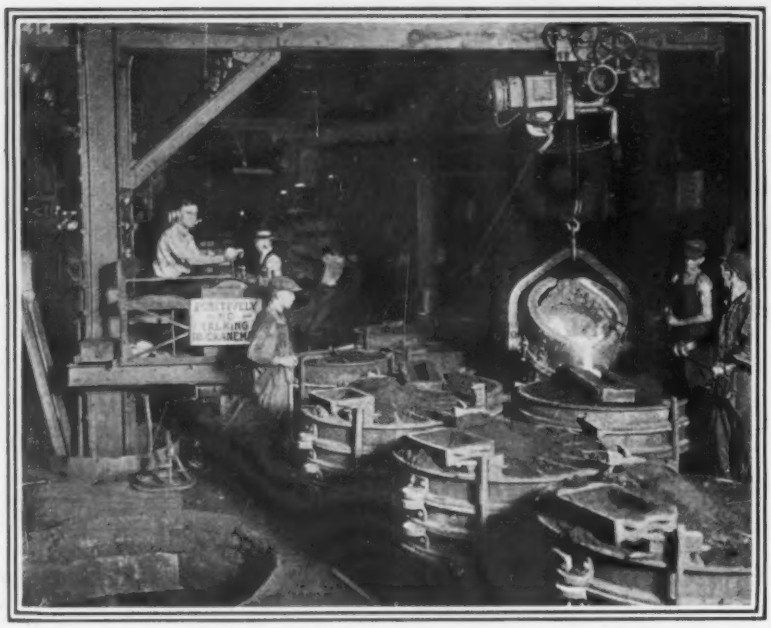
Women are employed in almost every department of the foundry, and are working to the satisfaction of themselves and their employer. They do no grinding, nor are they found working around the tumbling barrels, but they do molding, make cores, operate machines and hoists, handle small castings, and do light chipping and cleaning. They work side by side with men, and frequently have resented any effort on the part of the men to assist them in their tasks. In the assembly department they assist in the setting up of tractors, especially the smaller gas engines. Their working apparel con-



Section of Foundry Where Light Work Is Done, a Feature Being the Large Wooden Tanks for Molding Sand, the Sand Entering the Tanks Through the Overhead Chutes. There are eight tanks and to each are attached four vertical squeezer-type molding machines. In the foreground is a grating over which the flasks are shaken out. The sand can be kept in good working condition for days

sists of overalls and blouse, their hair being protected by caps. At noon they throng the company's cafeteria with the men, and they display every indication of being contented and a happy element of the establishment. They receive good wages.

In its electric steel department the company operates a Booth-Hall electric furnace, producing mostly what is termed tractor steel, although high-grade semi-steel, or special gray iron, has also been made in the furnace. The steel runs 0.35 to 0.40 carbon, the manganese being carried high to insure toughness and good wearing qualities, such as are required in the company's tractor pinions, of which a great many are made. The quality of the steel is such that these pinions cannot be broached, and the keyways are cut with a keyseating machine. The castings are very tough and resistant to wear, and on some the time of machine work has doubled since electric steel has been used.



Portion of the "Circle," Where Pouring Is Done Within a 65-Ft. Circle Accommodating 60 to 70 Molds at One Time. After pouring, the flasks are lifted by the large crane in the center and lowered through the circular opening at the left to a truck on the floor below. All the work is done in a space 80 x 80 ft. The empty flasks are hoisted through an opening outside the circle and distributed by monorail to their respective places. The flasks rest on trucks. Molding sand is elevated from the floor below by bucket conveyors

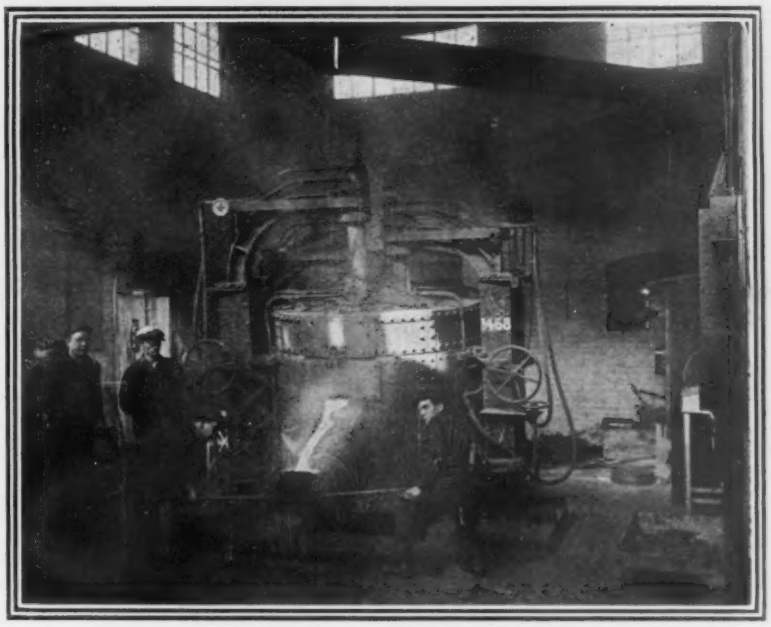
The furnace has a rated capacity of 1½ tons, and ordinarily makes five heats per day of 12 hr. It is charged at night ready for the first heat in the morning, so that the first heat is ready to pour by about 7 o'clock, when the molders start to work. The power consumption ranges from 560 to 620 kw. hr. per ton, although records as low as 460 kw. hr. per ton have been made. Up to Nov. 1,775 heats had been taken from the furnace.

The furnace is operated basic, and contrary to practice in many places the magnesite lining is carried to the roof, as the Avery Co. has found this to give best results. The furnace roof is of silica brick, and its life averages from 125 to 200 heats, which is considered unusually good for basic electric furnace operation. The hearth of the furnace lasts for an indefinite period. In a 2500-lb. charge for castings the following material was used: Punchings, 500 lb.; foundry scrap, 200 lb.; old rail, 250 lb.; sprues, 1050 lb.; boiler plate, 500 lb.

Front of Two Cupolas Showing Monorail System With Electric Hoist to Carry Ladles to the Molding Floor, Seen in the Background

About 10 lb. of 70 per cent ferromanganese and 25 lb. of 50 per cent ferrosilicon were added just before the heat was ready to pour, and between 2 and 3 lb. of aluminum were added to the steel in the ladle to insure a thorough deoxidation of the metal.

After the charge is placed in the furnace the night before it is customary in the morning to add about 5 lb. of carbon from old electrodes to compensate for the loss of carbon due to the oxidation of the charge which often takes place overnight.



Pouring a Heat from a Booth-Hall Electric Furnace in the Steel Foundry of the Avery Co., Peoria, Ill. It has a capacity of 1½ tons, has an auxiliary electrode to facilitate starting, and a solid conducting bottom. A second and similar furnace is being installed

Lime is used for forming a slag. Toward the end of each heat about 15 lb. of coke breeze is thrown on top of the slag to make it reducing. The metal is tapped from the furnace into shank ladles. The ladles are brought almost to a white heat by an oil heater, and to this is attributed a large part of the success attained. The ladles pour cleanly and there is no trouble in skulling.

Some of the interesting features of this type of furnace consist of the auxiliary electrode, which insures quick heating and no trouble at any time in obtaining contact when starting the furnace; there is a special type of door that seals tightly when closed, and a solid conducting hearth without bottom contacts or any kind of water cooling. The Booth - Hall Co. co-operated in every way possible to make the operation of the furnace successful, and the Avery Co. is now installing a second furnace of the same type.

Mr. Brandon, when asked what he considered the most potent factor in the operation of an electric furnace, said: "Success depends not only on a good melter, but on a capable electrical department in charge of an engineer to support the foundry. Foundrymen are not electricians. We have a first-class graduate electrical engineer with a competent assistant, and they are responsible for results."

The officials of the company are enthusiastic over the outcome of their electric-furnace investment. It furnished a source of supply at a time

Another View of the Cupola Building Interior Showing the Turn Which the Monorail Makes at the End of the Room Farthest from the Molding Room. The cupolas dump into a basement when the bottoms are dropped. The distance between tapping and charging floors is 25 ft.

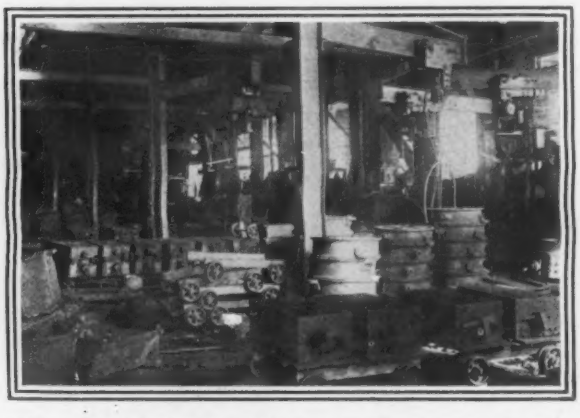
Chemical Laboratory of the Avery Co.'s Foundry, Where Analyses of All Heats Are Made. Raw materials also are tested in this department

when jobbing steel foundries were filled with Government work, reduced casting costs materially, and in the opinion of the company's operating department produced castings that are better than could be procured outside. The pouring floor is 40 x 160 ft.

Four Cupolas in Separate Building

Two No. 9 Whiting cupolas, lined to 72 in., and two No. 7 Colliau cupolas, lined to 48 in., all 55 ft. in height, are housed in a separate building of reinforced concrete, 54 x 64 ft., one advantage of this arrangement being that the cupolas can be tapped without the usual waste of time incidental to molders pausing to watch the operation. There are two large doorways between the cupola building and the main molding floor through which passes a continuous monorail serving all four spouts. A light and airy chemical laboratory adjoins the cupola room, a metallurgical chemist being responsible for the output of the cupolas. Both gray iron and semi-steel are melted. Between the tapping and the charging floors is a space of 25 ft. The building has a basement, a feature which makes for cleanliness and absence of obstructions on the tapping floor, inasmuch as the cupolas dump onto the floor below. From the cupola building and under the entire plant, to the bank of the Illinois river, runs a tunnel through which refuse may be removed.

The base of the foundry was the old Kingman Plow Works, but so much has been done in the way of alterations and additions that the foundry is practically new. Of course, much of the plow works proved valuable, including the larger buildings, especially, although they were remodeled and enlarged.



Section of the Avery Co. Foundry Illustrating the Free Use of Jib Cranes, Each Equipped With an Electric Hoist. Conspicuous also are the smal and light trucks on which completed molds are placed and then run out toward the center of the foundry for pouring

The old boiler room was converted to a coke storage. Pig iron and scrap travels in a straight line from the stock piles to the cupolas, on cars which, after weighing, are raised to the charging floor on a high-speed elevator, the coke and other materials being similarly lifted. The charging floor has windows on all four sides. From a foundryman's point of view the entire building presents a fine appearance.

Only two cupolas are in operation simultaneously, the daily production being 35 tons of semi-steel and 75 tons of gray iron. Since the war made pig iron scarce and expensive the proportion of pig used has been 30 to 70 per cent of scrap, this mixture, with increased quantities of ferroalloys, producing such good results that it is doubtful if there will be a return to the old practice, in which a higher percentage of pig was used. What is done, of course, will depend on the course of pig-iron prices. Ever in view in the Avery plant is the getting of hot metal as cheaply as possible at the spout. The mixture for semi-steel consists of 20 per cent steel plate, 35 per cent pig iron, and 45 per cent scrap.

Control at Central Electrical Station

The current for the electric furnaces, taken from the public service company, enters the plant at 13,200 volts, 3 phase, 60 cycles, and is brought down to 125 volts, 2 phase, by Pittsburgh transformers. As a means of cooling the transformers the air for the cupola blower is drawn through the transformer room, the inlet being at the roof and the outlet through a grating in the floor, thus insuring a constant change of air in the room, a system which has proved most efficient. The blower is of the General Electric centrifugal type, with a capacity of 10,000 cu. ft. per min., the pipe being of Armco iron, with joints acetylene welded. There is provision for cleaning the interior of the pipe, and it is designed to accommodate another blower when that becomes necessary. The blower room also contains a motor-driven air compressor and a motor generator, and is a central station controlling the entire foundry. Blast pressure is indicated by Clark meters in both the blower room and on the tapping floor.

Molding Sand in Wooden Tanks

The main molding room, 80 x 450 ft., was originally the forge shop of the plow works. Under half of this building, longitudinally, the earth was removed to create a basement, a task made greater by the fact that some large concrete foundations on which had rested forging machinery were in the way. Holes were dug and the huge concrete blocks were toppled over out of the way. This section of the molding room has a double floor of wood on which is 1 in. of pitch and 6 in. of clay.

The molding room is laid out in departments, there being one for light work, another for work of medium size, another for heavy castings, and lastly what is termed the "circle," which merits a description. Every department has noteworthy features. In the jobbing department are made to order the parts of old and obsolete Avery machines, some of these dating back 35 years, while the making of parts for machines 15 and 20 years old is commonplace.

First claiming attention in the light casting section is a row of eight circular tanks of wood, 6 ft. in diameter and 6 ft. in depth, which the employees jokingly refer to as the "silo system."

From the top of each tank ascends at an angle a chute connecting at the center of the room with a vertical bucket conveyor. Sand is elevated from the basement to the roof, a distance of 45 ft., by the conveyor, then drops by gravity down the chutes and into the tanks. To each tank are attached four vertical molding machines of the squeezer type, made by the company, there being 32 machines in all. Convenient to each machine is an opening in the tank from which sand may be shoveled.

Operations follow in this order: With everything at hand, the molder does his work in the usual way, then sets the flask to one side and proceeds with another mold. After the pouring, which is done by hand wherever castings weigh less than 25 lb., the flasks are shaken out over grates, each 8 x 8 ft. in area, in the floor, and the castings are dropped into chutes. The sand goes to bins on the floor below, where it is worked over, tempered, and then fed to a cutter head, after which it is elevated as previously described. It is to be noted that sand retains moisture for days in the tanks, and thus remains in good working condition. The small castings come to rest on large sheet-iron trays a few feet above the floor, from whence they go to the tumbling barrels.

Small Trucks Carry Flasks to Center

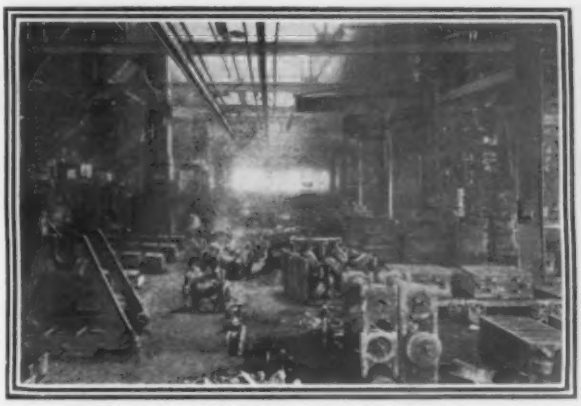
Down the center of the molding room run two lines of monorail for the relief of which there are ladle stands placed at convenient points. Medium-sized castings are made in a section opposite to that for light work. Here the molding is done with machines standing near the wall, the flasks thus being placed on light trucks or cars which run on small tracks extending to the center of the room. When ready for pouring, a flask is pushed along toward the center of the room and thereby makes space for another car and another flask. Pouring and shaking out over the grates is facilitated by a number of jib cranes equipped with 1 and 2-ton Sprague electric hoists. Castings of the larger sizes are not dropped into chutes, as there would be danger of their breakage. When the car system was first adopted the cars were made heavy, but they were later made so they could be easily handled by one man, and it was found they still possessed ample strength and durability.

The heavy work department has 6 hand-operated overhead traveling girders on roller bearings and carrying 2-ton electric hoists. In the entire foundry are over 50 electric hoists of Sprague design. The company built its own jib cranes, all of which are ball-bearing.

Great Production in Small Space

The "circle," a continuous foundry arrangement devised and built by Mr. Brandon, commands more attention from visitors than does any other feature of this unusual foundry. It occupies one end of the main molding room, where the earth has been excavated from underneath. In the center of a space 80 x 80 ft. is a 2-ton power-driven jib crane with a 20-ft. boom. At its base is an operator's cage, moving with the crane. Around this crane, the turntable of which is ball-bearing, and at the circumference of a 65-ft. circle, are eight hand-operated jib cranes, each equipped with a 2-ton electric hoist. Adjacent to the central jib crane is a circular opening in the floor 8 ft. in diameter.

Radiating from the central jib crane are 18 tracks for light cars. The molds are made on machines at the outer edge of the circle, placed



General View of the Foundry. Over a main aisle is a double monorail system, and on one side are cranes of the jib type equipped with electric hoists. To the left is shown a ladle stand, of which several are conveniently located. In the square columns at the left are bucket conveyors for raising sand from the floor below to the roof whence it falls by gravity through chutes into tanks

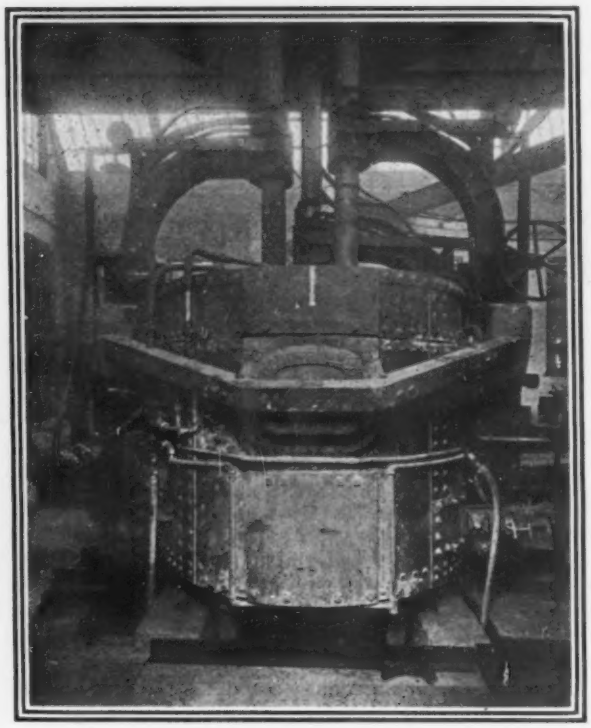
on cars, and then are pushed toward the center and out of the way of the molder, who works until the track is filled to its capacity. From 60 to 70 molds can thus be accommodated in the circle.

From the monorail communicating with the cupola room the filled ladle is transferred to the center jib crane and then the skilled crane operator plays an important part in the pouring. After the poured metal has had sufficient time to enable safe handling, usually about 5 to 10 min., according to the weight of the casting, the big jib crane picks up the flasks, one by one, swings them around, and lowers them through the circular opening in the floor. Each flask comes to rest on a car conveying it a few feet away and stopping at the bottom of another opening in the floor outside the circle. On the shake-out floor a young woman operates an electric hoist, the hoist performing the double function of assisting in the shaking out of the flasks and again raising them to the molding or pouring floor. The casting, still on a truck, and perhaps partly covered by sand to prevent too rapid cooling, goes to an adjoining cooling room. The metal flask has meanwhile been transferred to a monorail around the "circle," and is carried to any desired place in readiness for another molding operation. The system allows the production of over 320 molds per day, and all is done in a space 80 ft. square. All the castings made in the "circle," many of them large gears, are of semi-steel.

Conveyors Raise Sand to Molding Floor

At each corner of the 80-ft. square are bucket conveyors for raising sand from the basement to

Coreroom for Light Core Work. Young women must serve an apprenticeship here before they are put on larger or more important work. The department serves as a school



Rear View of the Booth-Hall Electric Furnace Showing the Manner in Which the Charging Door Is Kept Tightly Sealed. The auxiliary electrode is seen in the upper background. This furnace is making about five heats per 12-hr. day

the floor above. The sand is fed to cutter heads in the basement, the heads being driven by 5-hp. direct-connected electric motors running 900 r.p.m.

Facing material is distributed to all molding departments at night.

A cleaning room extends the length of the main building, and was created by roofing over the space between that building and a neighboring one. The company made its own mills by bolting large structural-steel channels to suitable end pieces. All foundry scrap is drummed before it goes to the cupolas. A Pangborn sand-blast room is a part of the cleaning equipment.

Between the cleaning building and that of a new machine shop is a covered railroad track, the two buildings being connected by monorails. After castings have been machined they are loaded, with those which require no machine work, on freight cars and taken a few blocks away to the assembly building, a structure 120 x 1080 ft. The company's machine tools, except a comparatively few, have been removed from this building to the new shop. Machines operating on cold rolled steel have been left in the balcony of the assembly building. The foundry and machine shops are favored by the fact that the land where they stand slopes to the Illinois River, the result being that the basement of the foundry and the main floor of the machine shop are on the same level.

Section of Cafeteria Where Foundry Workers Are Served With Meals at a Low Price

All Cores Are Reclaimed

Large and small cores are made in separate departments, each equipped with modern devices. Large cores are baked at night in double-end ovens. All core sand is mixed in Standard and Simpson core-sand machines at one end of the building housing the core work, a part of the equipment being a Sly core-reclaiming machine, the use of which has been especially valuable since bonding material has been scarce and expensive. Both gas, coke, and oil-fired ovens are used in baking. Small cores are made by women, this department serving as a sort of school for beginners. All must graduate from this room before attempting larger work.

The castings made by the company average 12 lb., the heaviest being about 700 lb. Work done on molding machines is steadily extending, the last step in that direction being the machine molding of pulleys. All gas-engine tractor parts are made with machine molds, and altogether 70 per cent of the output of the foundry is so produced. A point made by the management in connection with the fortunately passing antipathy of molders to machines, is that machinists have high regard for jigs and fixtures and are eager to use them, therefore why should not the molder favorably regard those to be used in his work? With certain steel pinion, production by machine averages 75 per day per molder, while an outside company not using machines made but 25 per molder per day.

At its Peoria plant the company manufactures all tractor and separator castings, and those required in one size of tractor motor. Castings for six sizes of motors are made in its Milwaukee plant. The foundry described in this article has all been built since Sept. 1, 1916, the first heat having been made Jan. 15, 1917. Further improvements and additions are yet to be made. Over the stock piles a traveling crane is being erected. The laboratory will have additional apparatus for physical tests.

History of the Avery Co.

The Avery Co. was founded in 1878 by R. H. and C. M. Avery. Robert H. Avery, a young soldier, while in Andersonville Prison during the Civil War, conceived the idea of making a corn planter, and, it is said, with a smooth space on the ground as a drawing board and a pointed stick for a pencil, he made the first rough draft that illustrated his idea. When free, he went to Kansas, but it was not until about 1874 that he built and put in successful operation his first working, full-sized model, conceived in Andersonville. In 1877 he returned to Illinois, and in copartnership with his brother started the manufacture of planters at Galesburg, Ill., in connection with other agricultural implements.

The success of the business had been so marked, and was so increased in volume by the adoption of one of the pioneer wire check rowers then being manufactured in large quantities, that the firm in 1882 moved to Peoria, a location possessing many advantages, among them river transportation, railroad facilities, and a better labor market, and in 1883 the firm of R. H. and C. M. Avery was incorporated under the name of the Avery Planter Co., with an authorized capital of $200,000.

The manufacture of steam engines and threshing machines was undertaken in 1889, and in Sep-

tember, 1892, the death of R. H. Avery called for radical modifications in management and program. In 1899 the business was reincorporated, with an authorized capital of $600,000, and the name changed to the Avery Mfg. Co.

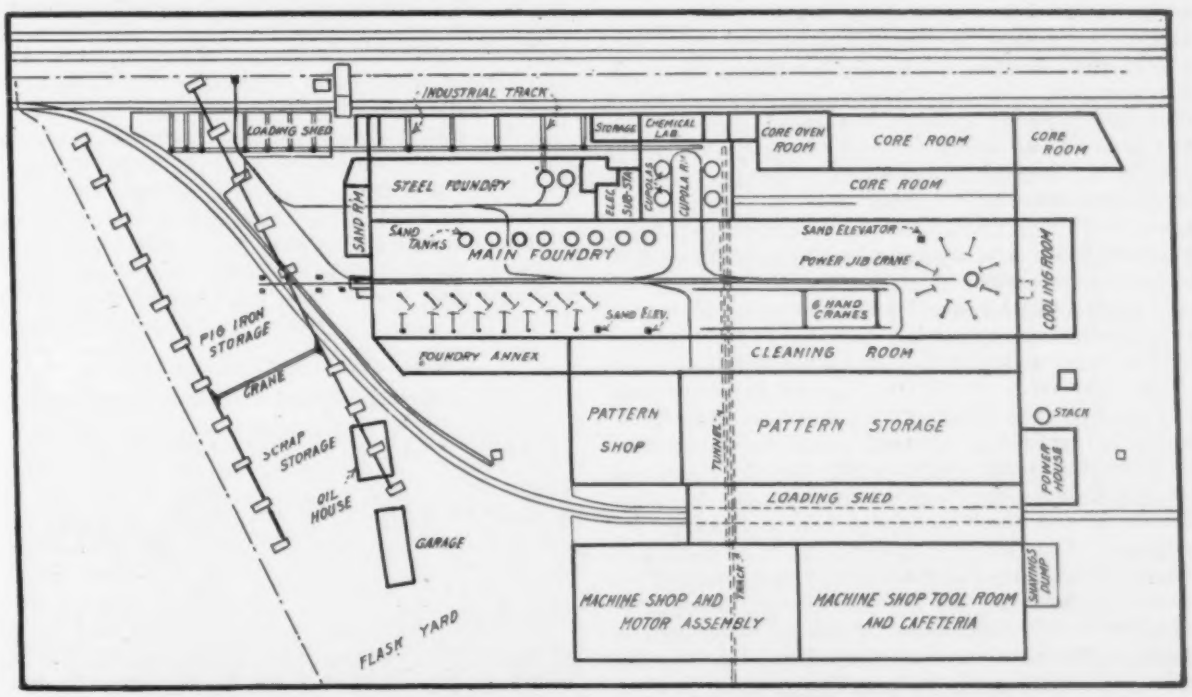
By 1907 the annual business had reached the volume of nearly a million dollars, and following the death of C. M. Avery, who had been the sole financial manager from the outset,, and when it was discovered the company's charter was about to expire by limitation, the business was reorganized under the corporate name of Avery Co., with an authorized capitalization of $2,500,000. The present capitalization of the company is $3,500,000, and the officers are as follows: J. B. Bartholomew, president; R. J. Boynton, vice-president; G. L. Avery, secretary; and E. A. Cole, treasurer.

At the present time the Avery Co. is one of the largest producers of farm tractors, threshing machines, engine gang plows, motor cultivators, and other motor-driven farm machinery. Its factories, branches, and various offices, employ more than 3500 people.

The main or No. 1 plant, at Peoria, is on a tract of 61 acres, while plant No. 2, a short distance away, is on a tract of 15 acres. The motor division of the company is a plant at Milwaukee, Wis., all new, and erected within the last 2½ years, including a machine shop, motor assembly, overhead crane system, and foundry.

The Avery Co. was the first industrial concern in Illinois to give its employees the benefits of a complete medical dispensary. This is maintained at all plants without any expense to the employees, and special attention is given to the liberal and kind treatment of employees who are accidentally or otherwise injured in the performance of their duties. This branch of the company's activities is under the direct supervision of Secretary G. L. Avery, son of C. M. Avery, who has been actively connected with the institution since leaving college.

Type of Large Gear of Which a Great Many Are Made in the Avery Co.'s Foundry. This view is in the heavy work department. Like other departments it is served by a double monorail system, the hoists being electric



Ground Plan of the Avery Co.'s Foundry at Peoria, Ill., for Electric Steel, Gray Iron and Semi-Steel Castings. Most of the buildings are the remodeled plant of the old Kingman Plow Co. Especially notable are the tanks for molding sand, the crane facilities, and what is termed the "circle" for rapid, continuous production

The Western Malleables Co., Beaver Dam, Wis., has presented to the Western Malleables Social Club, a welfare organization of employees, a complete clubhouse located on the second floor of its new pattern shop. The clubhouse consists of three large rooms and an auditorium, the whole representing an expenditure of nearly $5,000 for interior finish, draperies, furniture and other equipment. The formal opening of the club has been set for New Year's Day.

Tables have been prepared by the Statistical Section of the U. S. Employment Service showing requests for help from employers as compared with registrations with the Service for jobs for the 13 weeks ending Nov. 30, which indicate a general decline in the demand for labor throughout the United States. In a number of sections this decline began early in September; in others there was an increasing demand up to the middle of October, immediately followed by a sharp decline.

The Steel Markets of the Pacific

Competition with Japan—Conditions in China—Markets in Australia—Competition from Europe—International Free Trade

BY THOMAS T. READ

THE opinions entertained by experienced business men as to the conditions that are likely to obtain in business during the period after the war vary so widely that it would indeed be foolish to attempt to prophesy what our trade conditions with the Orient are likely to be. It is, on the other hand, desirable to give them careful consideration, for they are likely to play an important part in the readjustment of international trade. There are certain factors on which there is substantial agreement; others are so uncertain that only an expression of individual opinion can be made.

Three Important Questions

Three questions may be asked: Is trade with the Orient likely to be an important factor in the sum of foreign trade and if so, is commerce in iron and steel products likely to be an important part of that trade. If the answer to the second question is yes, what is the outlook for American manufacturers who may seek to find in Pacific markets sale for their products.

Back of these three inquiries is the fundamental assumption that the productive capacity of American iron and steel plants, expanded to meet war needs, will for some time at least be greater than domestic markets can absorb and it will hence be necessary to seek in foreign countries, more diligently than before, a market for the products of our furnaces, mills and fabricating plants. Before the war domestic business occupied the big tent and foreign business was the side show. When the growth of domestic consumption brings it up to productive capacity it is likely that this relation will again hold, for there are many advantages in a concentrated business as compared to a diffused one, but it seems certain that for the time being foreign trade (which normally doubles every 20 years) will be much accentuated.

One reason for this is that we will come out of the war with 25,000,000 tons of shipping that will compete for the carrying trade of the world, with the result that freight rates will be forced down to the point where less loss is sustained through keeping the ships in operation at low rates than in laying them up and allowing them to deteriorate. The letter Mr. Hurley has already addressed to all National Societies shows clearly that it will be the policy of the Emergency Fleet Corporation to foster over-seas traffic by every means in its power.

International Free Trade

Whether trade across the Pacific will be of much importance as compared with that across the Atlantic is a matter of opinion. The latter has for decades been much the more important. The distances are less and the huge loans America has made to her European allies will call for yearly interest payments that the debtor country will endeavor to recoup by increased sales of its products in this country. This will require the pushing of those lines of industry that are most profitable in order to get the maximum return out of foreign trade, and relinquishing to other countries trade in the products that are most profitable to them. This, followed to its logical conclusion, leads to what is practically international free trade.

An example will serve to make this point clear. A manufacturer of ready-mixed paint may take the stand that he should protect himself by making everything that goes into his finished product. This would lead him, in the end, to the mining and smelting of ore, the making of lead and zinc oxides, the manufacture of oils, the making of tin plate for cans and lumbering the stock for his packing containers. No manufacturer could adhere to such a policy beyond the point to which he could make all these things as cheap as he could buy them in the open market; and ready-mixed paint manufacturers, on the average, buy such materials in the open market and content themselves with the profits to be made from the manufacture and sale of paint.

The same principle may be applied to foreign trade. The Italian people will have to pay interest on the loans the United States has made to the Italian Government. Manufactures of silk, cotton and wool, macaroni, automobiles, etc., are the principal things that Italy sells abroad, or, in other words, they are the things the Italian people find it most profitable to make. Italy imports wheat, coal and iron. If the Italian Government tried to make itself industrially independent by imposing an import duty on wheat, coal and iron, the inevitable outcome would be to increase the cost of production of the exports listed above; it would hamper a big business to foster a small one. In order to pay off their war debts the countries of the world will have to concentrate on the lines that are most profitable to them, and let the other fellow handle the business that he is best qualified to handle. In short, the carrying trade across both oceans is likely to increase greatly.

Market in Devastated Europe

Whether there will be a large market for American products in rehabilitating devastated Europe is as yet uncertain, and weighty authority can be cited for either view. Personally, I think there will be. The best way out of a difficult business situation is often to borrow more money, and a bank often finds it better business to make further advances to a firm that is already in its debt rather than to refuse them. The trade that was firmly rooted in the battlegrounds of Europe will inevitably spring up again. Whether this trade will be permanent is another matter; when the Japanese took over the South Manchurian railroad, they bought rolling stock from America to equip it as quickly as possible, but that which has been needed in recent years has been made in Japan.

The countries of the Pacific littoral, with the exception of Australia, have kept relatively free from the burden of the war, and should emerge from it correspondingly free from war debts and taxation. With the exception of Japan, they are comparatively undeveloped countries, which means that they

have a better chance to increase their buying power in our markets through increased sales of their raw materials to us. And various short circuits in international trade are developing. We formerly got all our tin from Europe, but now the ore comes to this country and is smelted here. Chinese antimony formerly went to Europe and was resold here; now it comes direct to this country. It is reasonable to suppose that a good deal more trade in raw materials will be deflected to this country.

The conclusion, therefore, is that international trade as a whole will increase and that Pacific trade will show a larger relative increase than will that across the Atlantic. As for permanency, the Pacific is much to be preferred, for it will take a long time to equip the relatively undeveloped countries that border the Pacific and their raw materials, as return cargo, will serve to keep freight rates low and furnish the means of making payment for what we sell to them.

Initial Equipment in Undeveloped Countries

The answer to the second question has already been partly covered in the discussion of the first. Undeveloped countries are the best places for the sale of initial equipment. This must be qualified. Peking needed a modern telephone system and was therefore a good market for the sale of telephone equipment. Mongolia is not a good market for telephone equipment because its inhabitants do not need telephones and would not use them if they had them. It is only a rapidly developing country that is a good market for the sale of initial equipment. A highly developed country may be a poor market for the sale of initial equipment, but offers a very good market for sales to replace wastage and meet increases. Most probably the telephone equipment required to replace losses in Boston in a single year is larger than that required to initially equip the whole city of Peking, which has about the same population as Boston.

But providing the initial equipment also means providing a permanent market for replacements. The countries bordering the Pacific are lacking the initial equipment of iron and steel products, and, as will be seen later, they offer relatively little promise of being able to provide it for themselves. The conclusion therefore is that traffic in iron and steel products will be an important factor in trans-Pacific trade.

Competition in Steel with Japan

The final question is, what is the prospect of a large slice of trans-Pacific trade in iron and steel and their products falling to the share of American manufacturers? Japan will be a large factor in the answer to this. In an earlier article* I discussed the iron and steel industry of Japan and pointed out that even at the hoped-for rate of growth the Japanese iron industry would not be able to keep ahead of the domestic consumption for some time yet. The cost of production of pig iron and semi-finished steel is not low, either in the plants in Japan or the Japanese-controlled plants on the Asiatic mainland.

If the American producer gets down to bedrock production costs in order to keep his plants running, and our shipping gets down to bedrock carrying charges in order to keep its boats busy, there seems every reason to suppose that the American producer of pig iron, steel and finished products can sell in the markets of Japan in competition with the domestic producer. Unless the Japanese plants are protected by import duties it will be doubtful whether they can meet American competition after the war. Japan's trade with the United States has grown so much that her buying power has much increased, while her rapid development as a manufacturing country has made her a big market for machinery. If the league of nations, which is talked of after the war, really materializes and provides for anything like international free trade, Japan is almost certain to be a good market for American iron and steel products. If, on the other hand, Japan sets up a tariff barrier, all our products except our specialties are likely to be shut out.

The Needs of China

China is almost totally lacking in initial equipment of iron and steel products except near a few big cities and the railroads which join them. The projected railroads that are in course of building or hope to be built, represent a good deal of iron and steel in one form or another, and if they are built will lead to industrial development that will call for more iron and steel. China is the most promising country in the world, but it is also the most disappointing. Her government and finances pass from one critical stage to another without ever quite collapsing or getting much better.

It is now suggested that after the war the principal powers establish a sort of joint receivership over China and proceed to reorganize its government and industry in much the same way that Sir Robert Hart reorganized its customs service. Whether that is practicable will remain to be seen, but it seems almost too much to hope that the long struggle for special rights in China will soon give way to a real open door. Trade conditions in China are so complicated by all sorts of special rights and restrictions that it is impossible to generalize about them. About all that can be said is that in the next 50 years China will require a good deal of iron and steel products and they are not going to be available from domestic sources.

Writing on iron and steel in China eight years ago I pointed out that while there was no hope of development of the native industry, one modern plant had been built up and the conditions indicated that others could be developed. This has proved to be a mistake of judgment. The ore body, on which the one modern plant depended, proved on further development to be much smaller than was believed, and the other places in which ore bodies were hoped for also disclosed only disappointingly small reserves of ore.

It may now be said that China will never be a big producer of iron and steel unless ore bodies should be discovered in places where there is no reason to expect them. The known ore bodies are all under Japanese control and will be utilized for the benefit of the Japanese iron and steel industry. Other things being equal, the United States should have a good chance in the steel markets of China as they develop, but the whole subject is so complicated by diplomatic relations that it is impossible to discuss it without many ifs, ands and buts. Chinese trade is worth going after, but it is necessary to know the game before mixing into it.

The Australian and Malay Markets

Australia as a steel market after the war is difficult to analyze, because it depends so largely on the relation of the island continent to the mother country. The one blast-furnace plant in Australia is too new to give much indication as to what success it will achieve after the war. At present it looks as though Australia would never produce any

*THE IRON AGE, May 16, 1918.

large part of the iron and steel she needs and the labor conditions there are such that production costs can never be low. Arrangements are already made for the diversion to England of the smelting of Australian lead-zinc ores, and British manufacturers will have the first chance to supply the return cargo. Traffic between Australia and the United States is of such a nature that we seem to be at a disadvantage there as compared with the European manufacturer.

The islands of the Malay archipelago and the mainland over against them are likely to be of increasing importance as markets for the United States. The war has interrupted their trade, for ships could not be spared to trade with these remote places, and when it is resumed it is likely to seek some new channels. With plenty of ships under the American flag, the producers of raw materials are likely to send more and more of their output to the United States, with the natural result that they will buy more and more of our products. This tendency will be greatly helped if American capital becomes available for investment in enterprises in this field, and it is reasonable to suppose that this will be the case.

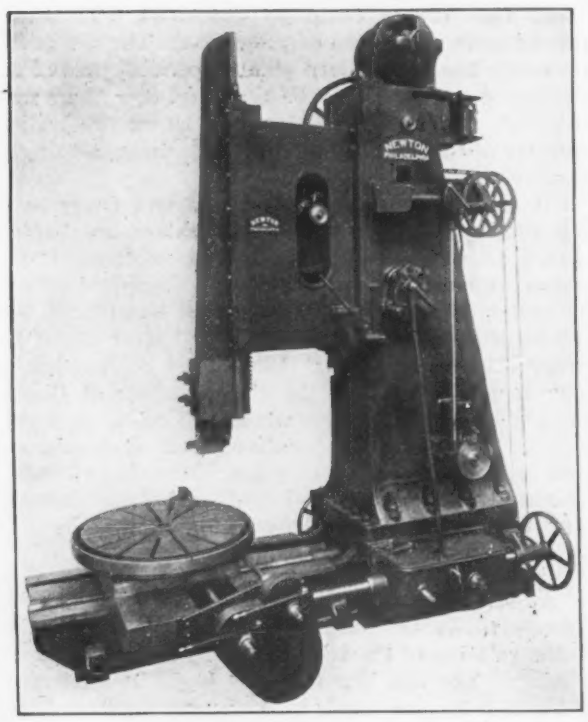
Nothing has so far been said of European competition in Pacific markets, for that is too uncertain a quantity. It is reasonably clear that "made in Germany" is not going to be the big factor in every market that it was before the war. What part British manufacturers will play is less easy to foresee. About all that can be said is that American producers were not afraid to meet European competition before the war, and with the German commercial agent a thing of the past it ought to be easier going in the future.

No one ever writes about foreign trade without upbraiding the American producer for the methods he pursues. It has all been said so often that I will take it for granted and not repeat it here. It may all be summed up by saying that the way to get foreign trade is to go out and get it; and the first requisite for that is to know what is wanted, where it is, and how to get it. To get trade in the Antipodes many months on the road and high traveling expenses are a prerequisite, and a long time elapses before success is evident. It is correspondingly worth while, therefore, to make careful preparation before embarking on such an enterprise, and wherever practicable a group of producers should pool their interests and secure joint representation in foreign fields.

Newton Upright Generating Planers

The Newton Machine Tool Works, Inc., Philadelphia, say that their developments on machines that are ordinarily known in the trade as slotting machines, and the uses to which these machines have been put, suggest the necessity of rechristening, and they have therefore called their machines, as built at present in the new design, upright generating planers.

One of the very latest of these machines having a 72-in. stroke is illustrated. This has the newly developed method of stroke control disc. The trips can be operated by hand while the machines are in motion, a desirable feature to compensate for any drift of motors. The control apparatus is on the bottom of the upright within convenient reach of the operator. There is a duplex control of the hand elevation for the cutter bar ram, a safety feature to prevent the dropping of the cutter bar guide or yoke should the rope on the counterweight fail at any time. The machine has an adjusting rack on each side of the frame, the adjustment being by means of worms and worm wheels arranged to be opposed in directions of rotation. Some chips collected in the works of the Heppenstall Forge and Knife Co., Pittsburgh, show remarkable strength and steadiness of cut.



Newton 72-in. Upright Generating Planer

These rack-driven slotting machines or Upright planers are built in sizes having 36 to 72-in. maximum stroke and cutter bars are counterweighted having square bearings in the guides with taper side-adjusting shoe and the vertical clamping surface is solid, steel faced, with suitable tool-holding clamps. Beneath the ram is the new steel swiveling relief tool-box apron operating in any position of a complete circle.

Motion from motor to the steel rack on back of the ram is transmitted through all steel spur reduction gears, whose coarseness of pitch and width of face increase with reduction of the gear speed. Gears are covered and on the operating side of machines all gears are completely enclosed.

Circular tables are heavily ribbed and have full bearing on the saddle, to which they are held by corner clamps and centered by a deep-face large-diameter bearing. Table saddles have narrow guide alignment control with central feed screw and taper shoe fit. Hand adjustment of saddle is from both ends of the cross slide. Feed screws have bearings on each end for smooth operation in tension.

Feed motion is from a rocking friction box having on the outside the pawl rod stroke adjusting screw.

Iron Ore and Pig Iron in Ontario

In the first nine months of 1918, a total of 154,243 tons of iron ore was shipped from Ontario, according to the Ontario Bureau of Mines. Of this, 84,886 tons was shipped to Ontario points and 69,357 tons outside of the province. In addition to the output of the Algoma Steel Corporation and Moose Mountain, Ltd., shipments were made by the Poe Mining Co. from Palmerston township, Frontenac county, and by the Canadian Union Iron Mines Corporation, from Drummond township, Lanark county. In the production of pig iron, 1,083,456 tons of ore was smelted, but only 87,106 tons was of Ontario origin. Eight furnaces were in blast and they were operated by four companies. Steel production was 668,333 tons.

Determination of Oxygen in Steel

Objections to the Ledebur Method Apparently Overcome—Details of the Modifications—Interesting Comparative Analyses

THERE has been need for many years of a reliable workable method for determining oxygen in iron and steel. All metallurgists are agreed that oxygen exerts an influence on cast iron and steel, and many will recall the important work done a few years ago by J. E. Johnson, Jr., in investigating the influence of oxygen on cast iron. The old method of Ledebur requires an elaborate apparatus, and takes so long that it has only been used in careful investigation work. Prof. P. Oberhoffer, a Luxemburger at the University of Breslau, describes a modification of the Ledebur method that he has worked out, and gives some interesting results. His article is in *Stahl und Eisen*, Feb. 7, 1918, and is abstracted below.

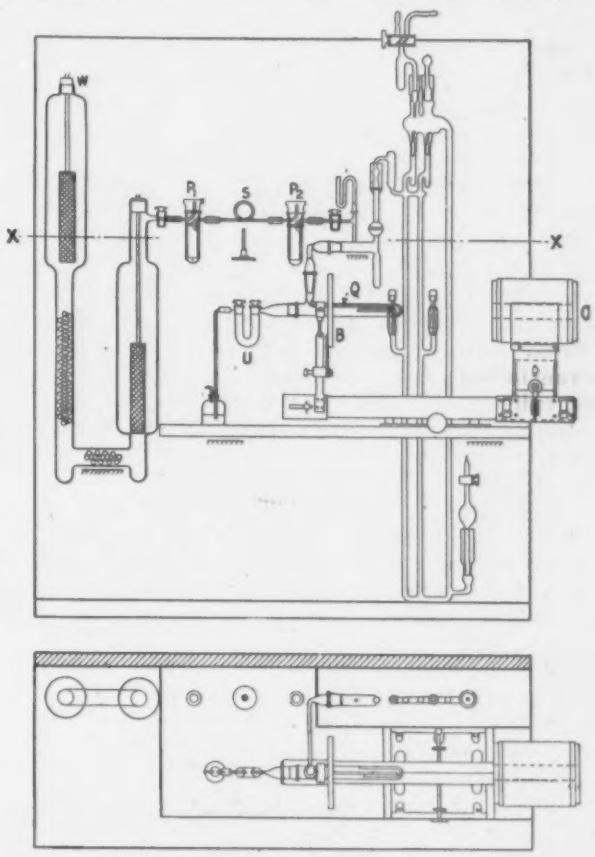
The old objections to the Ledebur method have apparently been met, for Professor Oberhoffer claims that results on the same sample agree within several thousandths of one per cent, the determination can be carried out in one hour, and the apparatus is simple and self-contained. This apparatus is shown in the illustration. Its chief constituents are:

1. An electrolytic hydrogen generator.
2. The purification train for the hydrogen.
3. A "Beutell" mercury exhaustion pump.
4. A quartz tube in which the sample is placed for heating, and accompanying P_2O_5 weighing bulb.
5. Heating arrangement.

Nos. 1 to 3 are arranged on a vertical board, and Nos. 4 and 5 on a shelf permanently attached to the board. A brief description of the diagram as illustrated is as follows:

The hydrogen is produced in the large U-tube marked W by means of nickel net-electrodes and a solution of two parts distilled water and one part concentrated potassium hydrate. The hydrogen passes through the tube P_1 containing phosphorus pentoxide, through a heated quartz spiral S containing platinum gauze, and a second P_2O_5 tube marked P_2. From here, by means of suitable pet-cocks, it passes to the quartz tube, Q, where the sample is placed in a small boat. This tube is held firmly in position by means of an asbestos protected clamp. All the connections are glass, and when once in place they do not have to be touched. The weighing tube, U, is also filled with P_2O_5. The electric resistance furnace, O, is arranged on a guiding rail and can be slipped into place when needed. The asbestos plate B protects the clamp and pet-cocks from radiated heat. On the right of the vertical board is the mercury suction pump held firmly by a clamp.

In preparing the sample drillings they should be obtained with a clean drill, free from any lubricant, and not taken too fast. Also turnings or milling cutter chips can be used. The temperature is measured by a thermocouple inside the resistance furnace and near the quartz tube, and 950 deg. C. has been found the most suitable. Twenty minutes at the desired temperature in an atmosphere of hydrogen has been found sufficient. For instance, one sample gave 0.041 per cent at the end of 21 min., and an extra 44 min. only raised this to 0.044 per cent. Ten grams is a good amount to take for a test and the whole determination can be readily carried out in an hour.



SECTION X-X

Apparatus for Determination of Oxygen in Steel

A most interesting table is given with the original paper showing the results obtained on 11 Basic Bessemer heats before and after deoxidation. The table has been prepared from this original table.

It is evident from these results that the deoxidation at the two plants was carried out in different ways, and the results from Plant B show how little ferromanganese was used. The author then briefly describes how microsections can be subjected to the influence of the hydrogen when investigating nonmetallic inclusions, and gives the name of the German company from which the apparatus can be bought. G. B. W.

Table of Results of Oxygen Determinations on Basic Bessemer Steel, Before and After Deoxidation

Test No.	Plant	Works Analyses C.	M.	P.	S.	Si.	Oxygen Per Cent	Average Per Cent
377 Before	A	0.01	0.20	0.052	0.040	0.02	0.075 0.083 0.078	0.079
377 After	A	0.31	0.54	0.077	0.040	0.11	0.018 0.011 0.017	0.015
385 Before	A	0.01	0.25	0.057	0.043	0.02	0.059 0.057	0.058
385 After	A	0.29	0.74	0.090	0.043	0.16	0.011 0.014	0.013
387 Before	A	0.01	0.25	0.063	0.041	0.02	0.066 0.073 0.076	0.072
387 After	A	0.37	0.63	0.085	0.039	0.14	0.016 0.016	0.016
14194 Before	A	0.01	0.15	0.036	0.039	0.02	0.069 0.070	0.070
14194 After	A	0.55	0.61	0.065	0.034	0.24	0.014 0.016	0.015
14195 Before	A	0.01	0.12	0.032	0.036	0.02	0.052 0.057	0.055
14195 After	A	0.09	0.25	0.040	0.034	0.06	0.020 0.016	0.018
14207 Before	A	0.01	0.14	0.032	0.037	0.02	0.082 0.084	0.083
14207 After	A	0.10	0.36	0.045	0.037	0.03	0.016 0.016	0.016
982 Before	B	0.04	0.26	0.054	0.039	0.012	0.068 0.067	0.068
982 After	B	0.04	0.28	0.055	0.037	0.012	0.044 0.046	0.045
980 Before	B	0.04	0.30	0.054	0.041	0.011	0.051 0.055	0.053
980 After	B	0.04	0.36	0.058	0.041	0.011	0.030 0.034	0.032
973 Before	B	0.045	0.33	0.056	0.041	0.008	0.059 0.053	0.056
973 After	B	0.045	0.39	0.066	0.040	0.009	0.034 0.036	0.035
963 Before	B	0.040	0.29	0.052	0.037	0.01	0.048 0.050	0.049
963 After	B	0.040	0.36	0.065	0.037	0.01	0.034 0.036	0.035
959 Before	B	0.040	0.24	0.052	0.037	0.01	0.075 0.074	0.075
959 After	B	0.040	0.25	0.059	0.036	0.01	0.035 0.039	0.037

Saving Tool Material in Winchester Shop*

Steel Basis Files Reduce Inventory and Furnish Record of Future Requirements — Steel Classification a Factor—Controlling Scrap

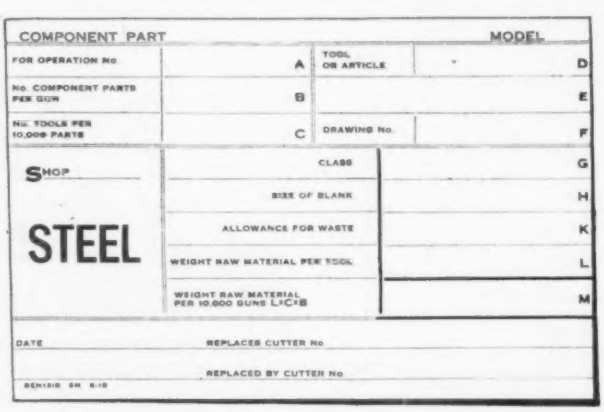
BY W. E. FREELAND

AN interesting development in connection with the tool department of the Winchester Repeating Arms Co.'s plant at New Haven, Conn., is a steel basis file, until recently operated by the central planning section of the tool department, but now in charge of a newly created central material planning division. Its usefulness can be gaged by the fact that in one year it reduced the inventory of tool and special steels about 80 per cent, a matter of approximately $1,000,000; this without interference with production.

The steel basis files (and other material basis files) are specifications and not current operating records. They were originated to bring about a better balance of steel in stores and to provide a means for determining the requirements for a considerable period ahead. The amount of steel on hand was easily ascertained from the balance-of-stores ledgers. The manufacturing requirements were determined in the following manner:

The tracings for all tools were secured from the drafting section and were examined by competent men from the tool department. The kind of steel to be used in the tool and the size of blank were checked; if neither of these items appeared on the tracing, they were ascertained and noted thereon. From these tracings the following information was transferred to the steel basis cards: model of gun or caliber of cartridge on which the tool is used; component part of that model or caliber; D, name of tool; F, drawing number; G, kind of steel; H, size of blank.

The steel basis cards were then turned over to a special steel committee which sorted the cards numerically by number of model or caliber and sent them to the planning section of the gun department or cartridge department for the notation of other needed information. The gun and cartridge departments filled in item A, operation number; B, number of component parts per gun or lot of cartridges; C, number of tools per 10,000 gun parts or per 1,000,000 cartridges. Items A and B represent actual facts which are not flexible and item C represents the best estimate available from past performance records.



Standard Form of Card Used in Steel Basis Files to Obtain Specifications for the Kind and Amount of Steel Required for Gun Tools. The cards for the steels for other kinds of tools differ only in necessary details

The steel committee next added item K, allowance for waste. This allowance was based on the weight of the blank and included an allowance for waste in cutting off and for spoilage in producing finished tools from blanks. A chart was made showing the weight of steel blanks for each change in diameter and in length from 1/16 in. to 6 in., in increments of 1/16 in. The basic weight used was that of soft steel at 489.6 lb. per cu. ft. Item L, weight of blank, was determined from this chart. An addition of 10 per cent of this weight was made in the case of high-speed steel to cover the difference in specific gravity. Item M, weight of raw material per unit lot, is ascertained by multiplying item L by item C. A steel basis file for machine parts was formed in the same manner, the estimates being based on yearly consumption.

Classification of Steel

The next step was the classification of steel. This step led to the elimination of large quantities of expensive tool steel. By grouping into classes steels in which interchangeability of brand was of little or no importance, it at once became apparent that many items of stock could be disposed of. The following classification was finally made effective:

Class 1—Superior grades of high speed steels.
Class 2—Commercial grades of high speed steels.
Class 3a—Finishing steels.
Class 3b—Non-deforming steels.
Class 4—Carbon tool steels.
Class 5—Miscellaneous tool steels of a brand where interchangeability was not possible or desirable.

In the miscellaneous steels, such as machine steel, screw stock and cold-rolled steel, standardization of sizes removed a considerable number of little used steels. The classification led to a method of purchasing steels on a fair basis of competition and provided assurance that the required sizes would be in stock when demanded.

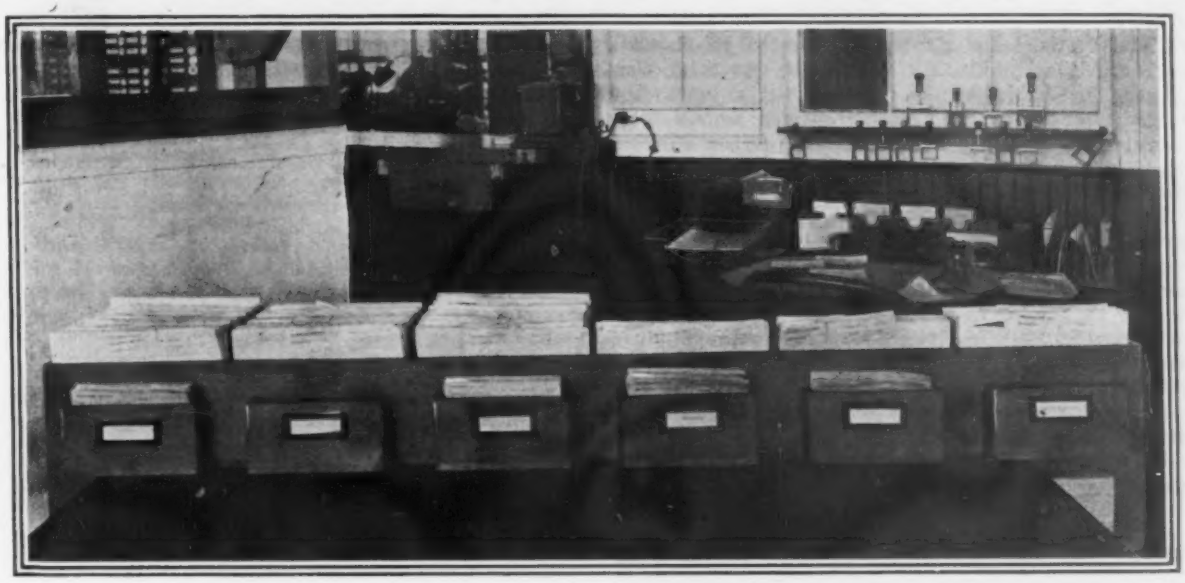
The next step was to review the sales department's and production department's needs to determine the sizes and amounts of steels that would be required to cover a definite period. By reference to the steel basis cards, the quantities of each size of steel to be purchased were quickly found and it was discovered that in many instances the quantities on hand were greatly in excess of the requirements. Purchases of these sizes were then deferred until the excess amounts had been consumed and the inventory reduced to its proper size.

As soon as a change in the consumption of tools becomes known, the preparation section of the gun department or the cartridge department advises the central material planning division of the new consumption rate which is immediately transferred to the proper basis card and the weight revised. Similarly changes in manufacture and changes in product for both guns and cartridges are reported so that proper changes can be made on these basis cards. When a change is made in the size or class of steel on the tracing or drawing covering any production tool or machine part, the preparation

*Tenth article of a series dealing with the Winchester Repeating Arms Co.'s plant and methods. The present article is the second of three devoted to the Tool Department.

section of the manufacturing engineering department makes out a proper steel basis card which is immediately forwarded to the central material planning division.

Green cards are used for the records for tools employed in making gun tools and red cards represent the tools used for making cartridge tools, these cards being filed directly in back of each gun or cartridge production tool card. This method of handling each unit shows at a glance not only the total amount of steel required per blank or per lot of production tools, but also how many tools should be made by the tool department for each tool required on the product.



The Desk of the Progress Clerk. This clerk checks and controls the movements of the working papers through the shop office

The complete file is cross indexed. Filing the various gun tool cards representing edging cutters, end mills, milling cutters, etc., by drawing number, and filing cartridge tool cards in accordance with the name of the tool, and finally bringing these two files together in a common file under the proper classification of steels and the further sub-division by size result in a valuable combination to aid in procuring for the shop the proper material.

The steel basis file has brought forth other good features in addition to those already described. Having at hand accurate records of steel requirements, it has paved the way for a more definite follow-up, keeping the purchasing department posted as to actual needs where definite information regarding delivery is desired. Through the efforts of those operating the files and their connection with the many departments throughout the plant there has been gathered much information regarding the uses of steel which would otherwise have been impossible. It has materially aided in doing away with unnecessary waste by furnishing a check on any requisition for material.

Controlling Scrap

An interesting method of controlling scrap in the tool department has been developed. In order to receive credit for his work each workman must turn in to the stock room the same number of pieces as he drew out, the spoiled as well as the good. The shop inspector determines whether work is to be scrapped and retains control of the spoiled pieces, filling out a damage report with as much detail as he is able to supply. The work spoiled on each order is kept separate and is sent with a third copy of the damage report, signed by the foreman, together with an identification tag, to the salvage inspection room. No shop overseer is authorized to keep scrap on the job for possible future use, but must make shipment to the salvage inspection room at least once a week.

The incoming stock is received in the salvage inspection room by a stock handler who verifies the count, weight and class of steel as marked on the identification tag. He also files the accompanying damage report by order number. After the salvage inspector has passed upon the material submitted, the stock handler places the pieces to be reclaimed in a location convenient for shipment to stores and puts the scrap in the proper bin together with the proper ticket or form.

The salvage inspector determines whether the material received from the shop shall be reclaimed or whether it is merely valuable as steel scrap. For the material which is to be reclaimed he makes out and signs a worked material received slip, a daily salvage report, puts his inspection data on the damage report, fills out a scrap tally sheet and a reclamation report for that item. For material that is to go as steel scrap, he makes a record of the material on the tally sheet and fills out an identification card which accompanies the rejected material to salvage section of stores. The salvage inspector will not receive material from the shop unless the proper charge is indicated on the damage report.

The reclamation report is made out by the salvage inspector in so far as he can supply the proper data from the damage report or the identification tag and from his own work. It is forwarded each week to the supervisor of inspection of the tool department at whose direction the shop scrap cost curve is plotted. The cost data are obtained from the purchasing department and the curve is plotted so that the ordinates of the chart represent the net cost of the scrap in dollars, and abscissas the days of the month. These curves are posted in the salvage inspection room for the benefit of those interested in decreasing the scrap in the various shops. The curves are plotted by men experienced in tool department planning so that a careful estimate can be obtained of the reclaimed value of the tools sent to stores, considering both the material value and machine operation cost up to the point at which the material takes its start to be made into new tools.

Labor Dilution as a National Necessity*

Proposes the Standardization of Products, Co-operative Effort of Legislators and Engineers, Education of the Public and Redistribution of Occupations

BY FREDERICK A. WALDRON

THE term labor dilution originated in England shortly after the declaration of war with Germany. It means the thinning out or spreading of the functions of the skilled workmen among those that are less skilled and a Bureau of Labor Dilution was therefore established by the Government to supervise and carry out its requirements.

The original objective was to employ less skilled workers for the purpose of accomplishing a given task in a shorter time. Economies heretofore unknown have been established and the fact brought before the manufacturer that many things were not at all necessary to the proper and efficient conduct of business. The bureau's work will become a national industrial asset and change the attitude of the employer and the employee to one of greater co-operation and higher efficiency.

Unintentionally, perhaps, and unconsciously, this bureau has created an element in labor dilution which was not in the original program, as it has already established in the minds of the consumer that waste of labor and materials is the greatest foe to labor dilution that a nation may have. This is a vital problem and the engineer must solve it in a scientific manner.

For years following the war our ideas will change and must be sacrificed to the needs of world welfare. That will be done to conserve and profits will become secondary. This will involve the engineering of men and materials in its broadest meaning, since the supplies of both have become so seriously depleted through the waste of war. When peace, prosperity and plenty prevail, there is an increased desire for ease, luxury and opulence by those who have accumulated wealth; and for lighter burdens and greater pay on the part of the workers. There is an inclination by all to neglect moral and patriotic responsibilities.

For 50 years the conservation of our national resources and economies in their production and use have been sacrificed for financial gain. During the past 15 years the attitude of the people has been a gradual change toward economies that must necessarily develop as we take a stand in the world's uplift. Ultimately it must be the survival of the fittest. A nation's industries must be those for which it is particularly adapted, they must be conducted in the most economical manner, and facilities for vending and transporting their products must be on an equally economical basis. For products of equal quality, those having the lowest unit costs will naturally maintain commercial and industrial supremacy.

National resources have no commercial nor financial value when dormant. There is no value in any natural resource until labor has been expended in its conversion to the use of man. That nation delivering its converted natural resources in the minimum time with least expenditure of human energy will lead the industry and commerce of the world. This means a most comprehensive national policy in organization—legislative, banking, business, agricultural, transportation, mining and manufacturing. As the value does not appear until labor is applied to nature's labyrinth of wealth, it is incumbent that the most careful study be given to labor requirements and performance.

Labor dilution should include the questions of the functionalizing of the work of the skilled operative for the less skilled, the eliminating of all work except that necessary to produce the results, and the economizing necessities. The conditions confronting us at the present time will confront us with still greater force during the period of adjustment to peace conditions. They can be summarized as follows:

The equipment and physical condition of our transportation facilities are not kept up to the pre-war standard. This will be cumulative and necessitate a large force of labor to restore the pre-war condition of efficiency.

Agricultural industries suffer for the lack of labor and intensified productivity of soil.

Our roads and highways are rapidly deteriorating by the lack of man power to construct new and repair the old roads.

The development of public utilities is practically at a standstill.

Irrigation projects are practically stopped.

The manufacture of munitions, when abandoned, will scrap an immense amount of machinery. This must be replaced by new.

Building operations other than those for immediate war needs have practically ceased.

The output of our steel mills was practically absorbed by the Government for war work.

Immigration has practically ceased.

The birth rate will supply but a small per cent of the man power needed.

From the above items it can be fully appreciated that the accumulation of work to be performed is stupendous. If our present methods continue the great problem will be to obtain labor. Without being pessimistic, it would seem fair that the facts should be faced and preparation made along the lines of labor dilution to cope with the situation.

The seriousness of the situation can be realized by quoting a few statistics: The high tide of immigration to this country was reached in 1913 and 1914, during which period 1,300,000 immigrants came to this country, of which it can be assumed that 900,000 to 1,000,000 were males of workable age. Of this number, 23 per cent came from Austria-Hungary, 23 per cent from Italy, 21 per cent from Russia, 8 per cent from Canada, 6 per cent from England, 3 per cent from Germany, 2½ per cent from the Scandinavian Peninsula, making a total of 86½ per cent. The remaining 13½ per cent came from all the other countries of the world. It is interesting to know that less than 17/100 of 1 per cent came from Holland, France and Switzerland.

From 1914 to 1917 over 800,000 immigrants came to this country, a number materially offset by the return to the colors of many immigrants of the pre-war period. During the year 1918 immigration to this country practically ceased. This country is dependent almost exclusively on immigrants for common labor in mining, agriculture, steel making, road building and the development of public utilities.

We cannot depend on European immigration to this country for this period. The depletion of man power by war losses and the demand for this power in the reconstruction period abroad combined with the internal development likely in Russia will mean that emigration from these countries will be prohibited. Of the man power sent by this country to Europe, at least 10 per cent will be incapacitated for strictly laboring work. We will be practically dependent upon native-born Americans based on our population of 1900 to 1905 estimated as ninety to ninety-five millions.

The best available statistics indicate that the average birth rate of this country is 25 per thousand population and that the death rate is 15 per thousand, leaving a net gain of 10 persons per thousand. This means that there would come to workable age in the post-war period about 900,000, approximately 400,000 males.

The influence of our educational institutions and

*From a paper presented at the annual meeting, New York, Dec. 3-6, of the American Society of Mechanical Engineers.

personal liberty have probably created in the majority of those coming of workable age a desire for work other than that of the ordinary laborer or mechanic. A review of these figures indicates that careful thought be given to the question of labor dilution as originally applied, and that action be taken upon it at once; and that there be reinforcement of this application by the changing of the mental attitude of the consumer and the manufacturer in favor of the principle that whatever is made or used shall be such that it partake of basic economy rather than of profit.

While the employment of an abnormal number of females as a war measure is right and justifiable, its continuation during the post-war period is problematical from the standpoint of the nation's manpower. This brings the subject of labor dilution as a national necessity to a phase much broader in meaning than that originally intended.

Labor dilution should not only functionalize the work of the skilled man with that of the less skilled, but it is equally important to eliminate useless labor which, at the present time, is deemed necessary due to habits formed in years of development and peace. Therefore, the problem of labor dilution can best be approached by classifying into the following program:

1. STANDARDIZATION (Indirect)
   - *a.* Legislative Methods.
   - *b.* Business and Financial Methods.
   - *c.* Transportation Methods.
   - *d.* Mining and Agricultural Methods.
   - *e.* Manufacturing Methods.
2. CO-OPERATION (Indirect)
   - *a.* Legislative Methods.
   - *b.* Capital and Labor.
   - *c.* Engineering Methods.
3. ELIMINATION (Direct)
   - *a.* Non-essential Statistical Work and Data.
   - *b.* Non-essential Office Work.
   - *c.* Non-essential Administrative Work.
   - *d.* Non-essential Sales and Advertising Work.
   - *e.* The Idle Citizen or Loafer.
4. EDUCATION (Direct)
   - *a.* Of the Legislator.
   - *b.* Of the Business Man.
   - *c.* Of the Engineer.
   - *d.* Of the Executives.
   - *e.* Of the Laborer.
5. OCCUPATION (Direct)
   - *a.* Analysis.
   - *b.* Distribution.
   - *c.* Localization.
   - *d.* Compensation.

Standardization (Indirect).—While the final effect of standardization on labor dilution is indirect, this is the foundation on which it should be built. The principal divisions are outlined above and will be briefly analyzed.

a. Legislative Methods.—All laws regarding the conduct of business should be simple and direct and the purpose in view should be the eliminating from the honestly conducted business, complications or hardships involving unnecessary expense and red tape; such laws to be drawn up with the hearty and consistent co-operation of the legislator, the business man, and the employee, with a view of making them as simple and direct as possible. With fair dealing, there should be no serious difficulty in establishing laws that would be much more simple and uniform than those at present in force.

b. Business and Financial Methods.—Where there has been rapid growth and an immense volume of business, it has necessarily carried an enormous labyrinth of complication, duplication and detail work, which requires a large number of non-producers to care for records necessary to deliver the raw material to the consumer. Standardization would, in a measure, automatically eliminate this labor and reduce the cost of doing business.

c. Transportation Methods.—The amount of labor involved in the transportation of raw material to the consumer, directly or indirectly, is enormous. By the adoption of standard forms of carriers, and an improvement in the vehicles of transportation, with improved methods of handling materials at the terminals, a great amount of labor would be liberated for other work.

d. Mining and Agricultural Methods.—The amount of labor on this work could be greatly reduced by the introduction of new and the perfecting of existing machinery. In mining, great progress has been made in the reclaiming of what was once waste ore. Strides have been made in the agricultural field whereby the productivity per acre of ground has been greatly increased. This practice has not been employed in a large number of the small areas under cultivation. Intensive mining and farming should be given more attention.

e. Manufacturing Methods.—Standardization of production in factories would eliminate surplus materials now carried in stock by the dealers, and would allow of interchangeability of parts that are most essential and enable business to be transacted direct with the consumer. This would reduce the inventory investment of manufacturers and dealers, thereby reducing the number of pieces to be made and the labor applied thereon.

Co-operation (Indirect).—It naturally follows that to obtain the benefits from standardization, co-operation should obtain to the fullest extent; and, by continuous and systematic effort by the legislator, business man, engineer and workman, the essentials under the head of Standardization would begin to produce results.

Elimination (Direct).—The natural result following standardization and co-operation would be elimination, since many employed at the present time would necessarily be transferred to other lines of occupation.

The general headings covering the classes of work eliminated are covered in the preceding classification.

Education (Direct).—Following standardization, co-operation and elimination, there should be a concerted effort to educate to a new epoch of economy. The term education is used for the change from that of extravagance to that of basic economy. It should teach that "Waste makes want, and want makes woe" and that the conservation of our energy and resources is of greater national value than the unlimited accumulation of the dollar.

Occupation (Direct).—Last but not least, occupation should be considered in the problem of labor dilution. An era is approaching when the conditions of the present and past will entirely change. This new era involves a wholesale change in the distribution of occupations. That this may be done with the least disturbance, a careful analysis should be made of the adaptability of the individual to the occupation and consideration should be given to the distribution of individuals to such occupations. Coincident with this, should follow the locating of industries at such points as insure economic production.

The occupational problem will always lead to differences of opinion, but is governed largely by supply and demand and the standards of living in different communities or nations. The lower the standard of living, the lower the compensation for labor. The higher the standard of living, the higher is labor compensated. The problem, however, resolves itself into production and delivery to the consumer at the lowest possible cost with a fair profit to the manufacturer.

These are facts showing that "a condition and not a theory" confronts us. To keep in circulation the currency of the world at the present rate it is necessary that public improvements, manufactories, agricultural and mining interests, should continue at a rate commensurate with the present circulation of money.

This means a gradual readjustment and the problem should be looked squarely in the face and the way paved for such readjustment with the least possible disturbance. This can only be done by careful planning and action on the part of the country's greatest men to meet the problem of labor dilution in a broad way.

The English, with their customary conciseness, have expressed in the words "labor dilution" that which it would require volumes to describe or discuss. A study of the problem indicates that labor dilution and the engineering of men are practically synonymous, the former involves all that the latter implies.

SIDE GUIDE AND GRIPPER

The Welding of Iron and Steel*

Principles Governing the Smithy and Forge —Effect of Oxidation—Use of a Flux—Annealing Essential—Conditions to Be Fulfilled

BY W. H. CATHCART

THERE was a time, not so very remote, when any reference was made to the subject of welding, one's mind naturally reverted to the ordinary smith's weld. In recent years, however, it is more often than not with reference to electric or some other form of autogenous welding that the subject is mentioned.

A great deal of attention has of late been directed to these other processes, and while this is just as it should be, it is to be regretted that little if any attempt has been made to impart a deeper knowledge of the laws or principles which govern the welding of iron or steel as it is practised in the smithy and forge. To scientists and others, and even to smiths and forgers, it may be somewhat of a surprise to have it said that in the smithy and forge there exist various mistaken ideas connected with this most important and useful process.

The reason for this apparent lack of interest on the part of scientists and real lack of knowledge on the part of practical craftsmen is not far to seek. On the one hand scientists take it for granted that practical craftsmen know all that they need know about their craft, and on the other hand practical craftsmen, believing that there is nothing more to be learned, naturally do not look for anything. To each, therefore, the need for a deeper knowledge is unknown, and since they are not in touch with each other, the valuable information which might be interchanged is not forthcoming.

It is the purpose of the present paper to deal with welding as it is carried on at the smith's fire and the forge furnace, and, speaking as a practical smith, I shall endeavor to treat the subject in such a manner as may best indicate to the practical craftsman certain fundamental principles, a knowledge of which should give him a better understanding of what welding really is, and should enable him to carry out the process in a thoroughly practical manner.

Welds Not Less Strong Than Original Metal

One thing that I very strongly object to is the statement in text-books to the effect that welds are a certain percentage less strong than the original material. Such statements have been taken from the results of welds which have already been tested, but they in no way indicate what may be expected from a weld yet to be made. From the fact that there is always present an element of risk in the process of welding it is manifestly impossible to forecast with any degree of exactitude the strength of a weld relative to the original material. Unfortunately, welds give widely divergent results, ranging from the imperfectly welded bar which has broken by reason of its own weight when dropped on the floor to that of the perfectly welded bar which has broken under a load greater even than the ultimate breaking load of the unwelded material. These statements serve no good purpose, especially in that they do not even supply the designer with any reliable data on which to work. They are far more likely to do harm because of the tendency to cause the craftsman to think that it is impossible to do better. It should be permissible to state that only when ideal conditions are secured it is quite possible to make welds which are not only equal but even superior to the original material. It is of the greatest importance that the matter should be presented in this way. Not only is it the only truly reliable statement, but in connection with the training of smiths the fact cannot be too strongly emphasized in order to stimulate them to aim at perfection in their work.

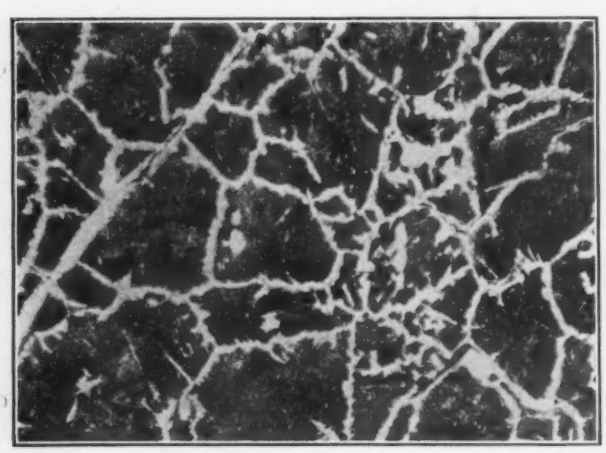
The unfavorable attitude taken up by some engineers with regard to welding is not entirely unreasonable, since the process is unquestionably fraught with uncertainty. This fact should indicate that there is great need for serious reflection and investigation. As the result of a close study not only of the process itself but of the skill and intelligence of the craftsmen concerned, I am thoroughly satisfied that the risks admittedly incurred would be very considerably lessened and the perfection contended for would be more often secured if the phenomena relating to the welding of iron and steel were better understood.

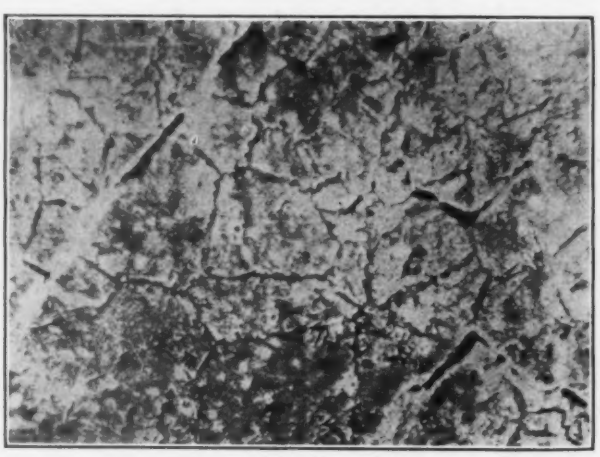
Several conditions must be fulfilled in order to secure perfect welding. The pieces to be welded must be heated to a temperature sufficiently high to give the necessary plasticity, but well below that at which the metal would burn. It is absolutely necessary to have clean metallic surfaces in intimate contact, followed by the intelligent mechanical treatment of the material.

Effect of Oxidation

Oxidation has much to do with the failure which is often experienced on attempting to secure these ideal

*From an article in the April, 1918, issue of the *Journal* of the West of Scotland Iron and Steel Institute, Glasgow, Scotland.





Figs. 1 and 2—Photomicrographs of a Piece of Steel which Cracked while Being Subjected to Mechanical Treatment at a Temperature Above That of Incipient Fusion. Both are 40 diameters. Fig. 1 (left) has been etched wtih an acid reagent; Fig. 2 with Stead's cupric reagent for the detection of burning in steel

conditions. In its earlier stages oxidation is the direct source of unclean surfaces; in its later stages it becomes the cause of burning—indeed, it is true burning.

When a piece of iron or steel is heated to about a red heat a thin scale begins to form on the surface. A definite quantity of oxygen from the atmosphere combines chemically with a definite quantity of the iron to form a new chemical compound known as oxide of iron, which is detrimental to perfect welding. It is quite impossible to weld iron or steel if there is oxide intervening between the pieces. Of course, it is quite true that by heating to a higher temperature the oxide will melt, but this may cause another very serious trouble. Unfortunately for the steel and for the advocates of such a procedure, the fusion point of the oxide is higher than the initial fusion point of some of the steel to be welded. As the temperature is increased, the more rapidly does the scale form, and when the melting point of the oxide is reached it is most interesting to note that oxidation does not cease, but really proceeds more rapidly than ever, the only difference being that the oxide, instead of taking the form of scale, runs off as molten drops. The outer layer of steel will be more or less robbed of its carbon, and on heating to a sufficiently high temperature, fusion will commence in the interior layers before it will do so in this outer decarburized layer. The diffusion of gaseous carbonic acid and carbonic oxide in the steel will cause it to froth up or boil because of these gases exerting sufficient pressure to cause the outer skin to rise in blisters and burst. On the walls of these gaseous cavities so formed films of oxide are deposited, preventing them from being welded together again. On forging down steel in this condition the surface is liable to have a very rough, cracked appearance, cracks being revealed more readily on the sharp corners if the bars be square or rectangular in section.

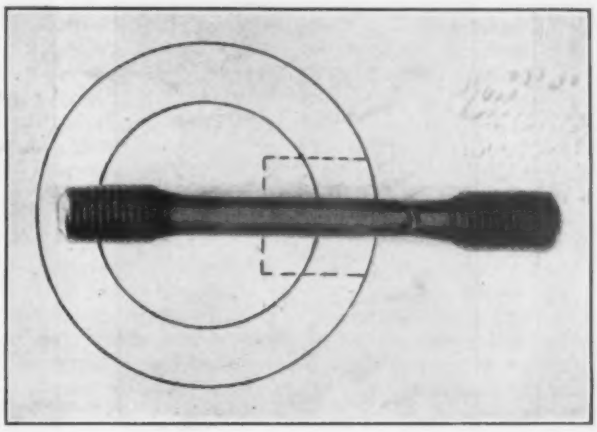


Fig. 3—Showing Where the First Piece Broke, Cut from the Piercer which Became Welded Into a Shell

Thus, in brief, does oxidation take place in iron and steel, but so far as the burning of steel is concerned the matter is still more interesting and complex. In order to the proper understanding of this point it will be necessary to consider the structure and constitution of iron and steel.

It is not generally known in the workshop that iron and steel are initially crystalline. The microscopic examination of a piece of iron or steel proves this indisputably. The process of making wrought iron affords an excellent opportunity for the study of welding. When a puddled ball leaves the furnace it is composed of small pasty granules of iron having a certain amount of fusible slag intermingled. On the way to the hammer some of the slag trickles out. The action of the hammer squeezes out more of it, and the more effectively this is done the more perfectly will the ball be welded together.

These balls are drawn down into bars, which, after being cut into short lengths, are piled one on top of the other, heated to the welding temperature, and again drawn down into the finished bar. It will be seen, therefore, that a bar of iron is really made up of a series of welded pieces. Moreover, if at any point in the junction of the weld the oxide has not been squeezed out there will be imperfect welding, and it is this unavoidable feature in wrought iron which causes lamination.

In steel, because of its being cast in the form of an ingot from the molten state, there is no such lamination as in wrought iron. There may be other troubles, but these do not concern us at present. Steel is not a homogeneous pure metal, but is a mixture of carbide of iron and iron with certain other elements, such as phosphorus, sulphur, and manganese, all of which have a more or less important influence on the metal. The carbides and phosphides are dissolved in the iron in the molten state, but on cooling down they separate out again. This process of separation is gradual, and extends over a considerable range of temperature. The purer parts—that is, those consisting largely of the iron itself—separate out first; the parts richest in carbon and phosphorus separate out last. From this it will easily be understood that the last portion to separate out has the lowest point of solidification, and correspondingly on reheating it has the lowest point of melting. In other words, on reheating a piece of steel there is a certain temperature at which certain portions throughout the entire mass will begin to melt some considerable time before the remainder.

We are now in a position to consider the effect of heating to an excessively high temperature two pieces of, say, medium carbon steel for the purpose of welding them together. In all probability the excessive heating will be due to the efforts of the smith to melt the scale or oxide which has formed on the surface. Two things may happen to the steel: First, if the blast be urged very sharply the metal on the surface may froth up causing the formation of surface cracks in the finished weld. Second, if the excessively high heating be prolonged, the steel while being hammered may develop cracks internally as well as externally to an extent depending on time, temperature, and amount of carbon.

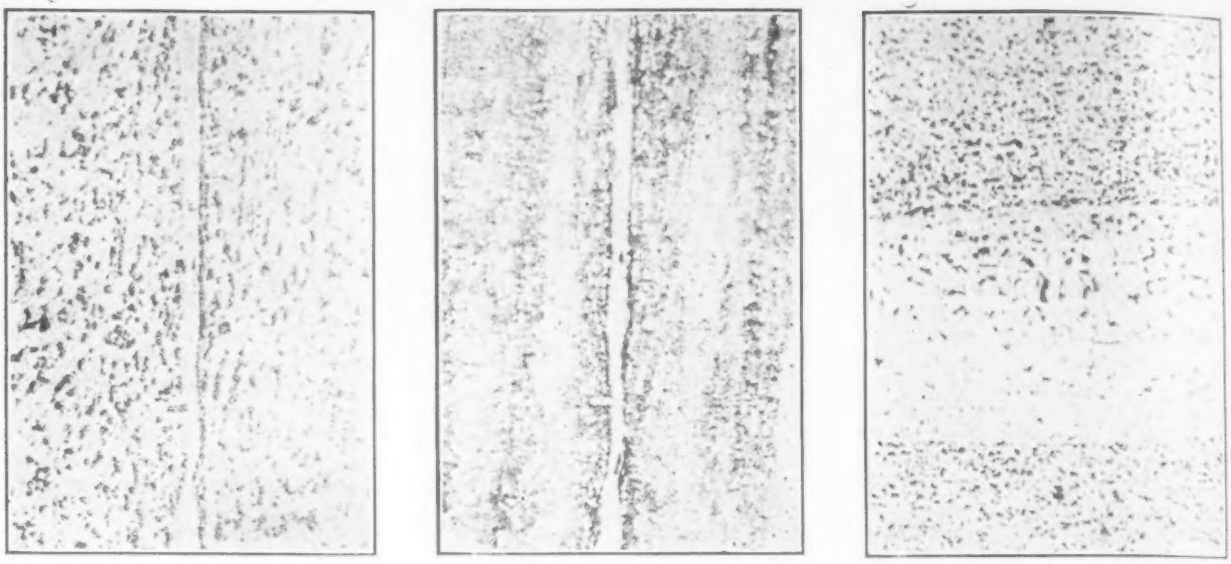
Such a condition happens far too often, and is due to the fact that the steel has been heated to above the point of incipient fusion; the carbides and phosphides have commenced to melt; small molten globules have formed in the bodies of the crystals, and these globules, on prolongation of the heating, may have run to the crystal boundaries in the form of more or less continuous envelopes, depending on the amount of carbon present in the steel. A piece of steel which cracked while being subjected to mechanical treatment at a temperature above that of incipient fusion is represented by Figs. 1 and 2. Fig. 1 is etched with the acid reagent, while Fig. 2 is etched with Stead's cupric reagent for the detection of burning in steel. These photomicrographs have been taken from exactly the same position on the specimen. In Fig. 2 the copper, by depositing on the ferrite lines which are purest, has revealed the fact that the rounded spots and envelopes which still remain white are rich in phosphorus, and that these portions were molten while the others were solid. It is important to note that the cracks follow the line of these envelopes.

A little reflection will enable the practical craftsman to realize why it is that apparently solid steel cracks and in extreme cases flies all to pieces when struck by a blow from a hammer. It is quite clear that the presence of molten envelopes more or less completely surrounding the crystal grains will very considerably lessen the cohesion of the material. Indeed, the mere act of withdrawing a piece of high carbon steel from the fire may be sufficient to break it in two if it be heated to above the point of incipient fusion.

Use of a Flux in Welding

This brings us to the question of the use of a flux in welding. I am quite satisfied that scientists and others will think it inconceivable that there should be two opinions about this matter, but the fact remains that many practical craftsmen are strongly opposed to the use of a flux, many use it wrongly and thereby strengthen the argument of the others, while few, if any, who use it rightly can give a reason for the faith that is in them.

SIDE GUIDE AND GRIPPER



Figs. 4, 5 and 6—Photomicrographs (40X) of Two Pieces of Steel Welded Together After Being Intentionally Heated on the Surface to Above the Point of Incipient Fusion. See text for full explanation

Let us consider what happens when a flux is used. We have seen that oxide of iron causes unsound welds, and that because of the relatively high temperature necessary to fuse it the steel is in grave danger of being burnt. Sand and oxide of iron, which by themselves are very infusible, become very fusible when in combination. They form a chemical compound called ferrous silicate, which has three very important advantages. It is fusible at a much lower temperature than the oxide itself, consequently the danger of heating to the point of incipient fusion may be obviated. Acting as a kind of varnish to the steel during the process of heating, it protects the material from further oxidation. Being very fusible, it flows very readily, and is so easily removed that there is no difficulty in securing clean metallic surfaces. In other words, it is simply a cleansing and protecting agent. It removes the objectionable oxide at a safe temperature—a temperature much lower than if it were not used.

It is rather a curious fact that some smiths regard a flux as a kind of sticky substance by means of which the welded parts are held together. This is by no means the case; it is just as objectionable as the oxide which it serves to remove.

It is necessary just at this point to add a word of warning, more especially that it will at the same time serve to explain why there is a diversity of opinion among smiths regarding the use of a flux. Sand is a very bad thing for welding if it be used in excess. But just as we do not stop the use of a pinch of salt in our porridge because we felt one morning as if the entire contents of the salt-cellar had been emptied therein, so, in like manner, we do not seek to cure the evils of excess by abandoning the use of this most valuable aid toward the attainment of perfect welding. It should be understood that a definite quantity of sand combines with a definite quantity of oxide to form the fusible ferrous silicate, and that if too much sand be used the amount in excess of what the oxide is capable of combining with will remain as sand. Moreover, the greater the excess of the sand, the thicker will this mixture of ferrous silicate and sand become, and the less readily will it flow off. Most assuredly, therefore, failure will follow if any sand be retained in the weld.

It is evident that many smiths who do use sand do not fully understand its advantages when they maintain that it ought not to be used on the face of the piece to be welded. From what has been said it should be quite clear that it is essentially the face of the weld that requires to be cleansed and protected.

I have here a piece of mild steel plate which presents a problem in welding occasionally encountered by smiths. This piece was cut from a steel plate 3/16 in. thick which had been bent to form a cylinder 15 in. in diameter and 12 in. long. It had been welded by means of an ordinary scarf weld, 3 to 4 in. being operated on at each heat. Hundreds of these plates have been welded without the slightest difficulty by the same smith, who, be it understood, is an expert at this class of work, but on this occasion every one of the consignment of plates cracked right along each side of the welded portion. The appearance of these plates when cold seemed to indicate that the material had been burnt, but after welding some of the plates at a temperature decidedly lower than that of incipient fusion the cracks appeared just as in the other plates.

In my opinion the material was redshort. From the fact that the melting point of iron sulphide is lower than that of the iron carbide we can see reason for the cracks taking place at a relatively low temperature, just as in the case of the carbide of iron the sulphide of iron would melt and add still more to the molten liquid by dissolving some of the surrounding steel, thereby lessening the cohesion between the crystal grains.

It has been stated that in nearly every case the actual welded part was good, there being very little evidence of cracks. At first sight this seemed rather remarkable, but a little consideration serves to explain. Setting to one side for the moment the question of redshortness or burning, there can be no doubt whatever that incipient fusion had taken place, either of sulphide or carbide of iron. This would be accompanied by cracks in the actual welded part during the process of welding. The reason for the absence of these cracks in the finished weld may be easily explained.

The smith who welded these plates always used a flux, and while heating the steel in the fire he was careful to have it covered with a nicely-flowing silicate. The action of hammering would undoubtedly cause the crystal grains to separate, but the presence of the fusible silicate would prevent the formation of oxide on the walls of the cracks, and the continuation of the hammering to complete the weld would at the same time weld the cracks.

To prove that this is quite possible I heated a piece of steel containing about 0.30 per cent carbon to above the point of incipient fusion. On flattening it under the steam hammer it cracked all over the surface. It was returned to the fire and sprinkled with sand. At a safe welding temperature, and while covered with a fusible silicate, it was forged down under the steam hammer. All the cracks were welded together again, and when cold the steel bent double without fracture. Another piece of the same steel was freely sprinkled with sand just before flattening it under the hammer. During the time that the cracks were developing under the action of the first few blows a little more sand was lightly dusted on. In this way oxide was prevented from forming in the cracks, and on continuing to forge the piece they were satisfactorily welded again, as was proved by the subsequent bend test.

Before passing on it must be distinctly understood that the welding experiments just described are not

put forward as a recommendation for the adoption of such a practice. They are intended only to show the action and value of fluxes. Steel should never be wrought at a temperature above that of incipient fusion. The examples serve to show further that if practical craftsmen had a knowledge of scientific principles they would be able with confidence to determine when it is permissible to adopt a certain course of action.

The following interesting example shows in a very remarkable way the effect of having clean metallic surfaces in intimate contact. For reasons that we need not enter into here a piercer could not be withdrawn after a shell had been pierced. After it had cooled I cut a section 1½ in. thick through shell and piercer. A small portion 1½ in. broad was cut from this sectional portion in such a way as to secure approximately the same amount of piercer and shell. This was heated very carefully to about 800 deg. C. and then forged down in a direction at right angles to the junction of the two pieces. One should have expected that the two pieces would have fallen apart during the process of forging, but instead of this there was not the least evidence of separation, and on subsequently turning the piece down to form the usual type of tensile test the result proved without the slightest doubt that the piercer and shell had been perfectly welded together. The test piece was turned so that the line of junction was exactly at the center. It broke at a point quite close to one end, as shown in Fig. 3.

I consider this to be an excellent object lesson to smiths and forgers in that it shows the remarkable and unthought of results that may be obtained when ideal conditions prevail. Let us look briefly at the conditions in this case, and then we shall find the reasons for the result.

The piercer was new, having clean metallic surfaces. It is true, of course, that it had a covering of black lead and oil, but very early in its passage into the steel billet this would all be removed from the surface of the piercer, which would then be in intimate contact with the pure, clean metal in the center of the billet. The piercer could not be withdrawn, and it would be gradually heated up sufficiently high to permit of welding to take place, even although the temperature would be much lower than that usually required. The expansion of the piercer and the contraction of the shell would supply the necessary pressure. An interesting feature was that the point of the piercer was not welded. This might seem surprising in view of the fact that this part would have the maximum pressure, but when it is remembered that the point would be in contact with the upper oxidized surface of the billet, and would carry it down with it, we have absolute proof again that it is only by having clean surfaces that perfect welding can be secured.

Two pieces of steel were welded together after being intentionally heated on the surface to above the point of incipient infusion. Figs. 4 and 5 represent the same portion of a section of the weld. Fig. 4 was etched with acid, and Fig. 5 with Stead's cupric reagent. The white band along the line of the weld in Fig. 4 shows that the surface of the steel has been decarburized during heating. In my opinion there is another reason, in this case, for the presence of the band of ferrite.

Dr. Stead has shown* that carbon and phosphorus segregate together in the molten state, and that on cooling down again the phosphorus repels the carbon. This would seem to have happened in this weld, for in Fig. 5 there is evidence that the band of ferrite is rich in phosphorus. Not only so, but on the bottom side of the weld there is a thin irregular band of pearlite. It should be stated that the pearlite appears black on etching with acid, and white with the cupric reagent.

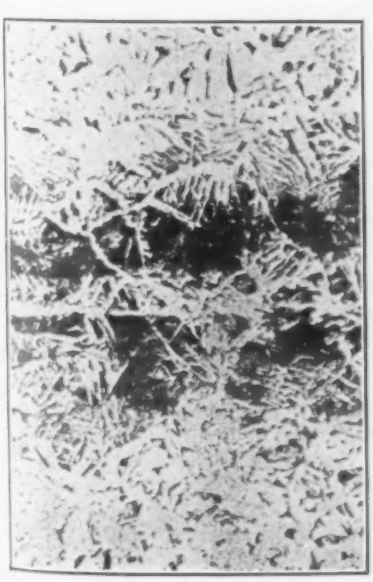
Apparently, therefore, on heating the surface of the pieces to incipient fusion, the carbides and phosphides near to the surface have become molten, and on cooling down again the phosphorus has pushed to one side any carbon not already removed by decarburization, and has itself remained in possession of the band of ferrite along the line of junction of the weld. Fig. 6 represents another portion of the same weld after annealing. In this portion the band rich in phosphorus and poor in carbon is very much broader.

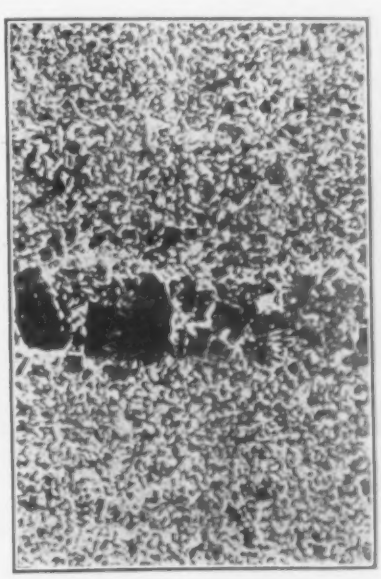
German and Austrian Welds

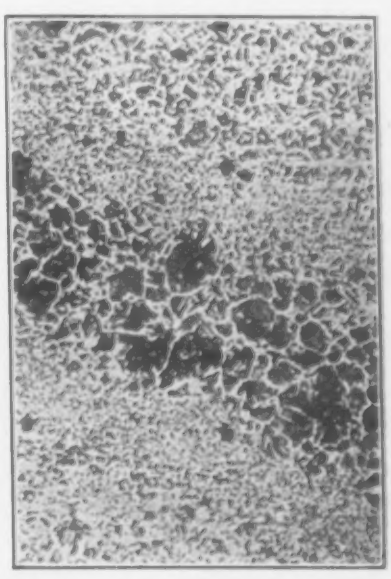
In a most interesting paper read by Dr. Stanton and Mr. Pannell some years ago at a meeting of the Institution of Civil Engineers reference was made to the results of welds which had been made in Germany and Austria. In the German welds good results were the exception, and the conclusion drawn was that all welding of steel should be avoided. In the Austrian welds the results were almost 100 per cent of the original material, but it was pointed out that this would undoubtedly be largely due to the fact that the welds were made from 1⅜-in. square bars which were subsequently drawn down to ¾ in. square.

In the discussion which followed the paper it was contended that in practice welds are never made in this way. Another objection was raised in connection with the length of the scarf in certain other welds described. It was found that the exceptional length of the scarf was due to the amount of staving previous to welding. Now, these two cases raise a most valuable point in connection with welding. It is certainly somewhat impracticable to make welds on a larger size and then forge down to a smaller size of bar, but I contend that it is good practice to stave up as much as possible within

*Iron, Carbon and Phosphorus and the Detection of Burning in Steel. The *Journal* of the Iron and Steel Institute, Vol. XCI, 1915.







Figs. 7, 8 and 9—**Photomicrographs of Mild Steel Welded, Using Sand as a Flux.** All are 40 diameters except Fig. 8 which is 80 diameters. See text for full explanation

reasonable limits in order to insure that the highly heated material will receive sufficient mechanical treatment, without which its strength and ductility will be very seriously lessened, even though the weld may be perfectly sound. Steel which is heated to and allowed to cool from a high temperature will be very coarsely crystalline, and may be exceedingly brittle.

Proof of this is to be had from the fact that many welds break at a point outside the actual welded portion, simply because these parts have been heated to the same high temperature but have received no work. The effect of work on such material prevents the formation of large crystal grains, and the lower the temperature at which work is stopped the finer will be the structure. It is simply absurd to expect good welds from a bar one edge of the end of which is knocked back to form a heel and the other edge drawn down to form the point of the scarf. The urgent haste with which a weld must be made is not at all favorable to good results. It is therefore most essential that sufficient material be provided to permit of as much work as possible being put on the steel after the actual welding has been accomplished. It should be said, however, that in one respect the objection to the length of the scarf in the welds mentioned, including those made in Austria, was quite legitimate, because they were being compared with pieces of the solid bar. A simple calculation will at once show that the points of the scarf would be well within the grip of the testing machine. It is obvious, therefore, that it was not a fair comparison.

Length of the Scarf

Because so much objection had been raised to the length of the scarf in ordinary practice, and believing that when the art of welding is properly understood good welds could be made even with a minimum length of scarf, I sought to prove this by carrying out a series of experiments.

Two pieces of mild steel 1⅜ in. in diameter were slightly rounded on the face at one end. These, with the judicious application of a little sand, were heated to the welding temperature and were gently butt welded under the steam hammer. It was at this stage that I made a most interesting discovery. For the purpose of ascertaining to what extent welding had taken place the first piece was laid down to cool pending microscopic examination. The structure shown in Fig. 7 was revealed. The original steel contained about 0.15 per cent carbon. As shown, in the vicinity of the welded portion the carbon has been very considerably increased. The coarse structure is typical of steel heated to a maximum temperature with a minimum amount of work. The same piece was then annealed, with the result shown in Fig. 8. This photomicrograph was taken at double the magnification of the other.

This is by no means what one should expect. The usual result of heating in the fire is decarburization, but in this case the welded portion has undoubtedly been very highly carburized. On reflection one can readily understand how this would be possible. The pieces were heated very slowly and carefully, the blast not being urged unduly, consequently the fire may have been in such a condition that instead of oxygen there was carbon monoxide in excess. This, in conjunction with the fact that the solid carbon in the fire would be in intimate contact with the steel, would cause it to take up carbon very rapidly, more especially at the high temperature prevailing at the time. Moreover, care was taken to maintain a suitable supply of ferrous silicate in order to reduce oxidation to a minimum.

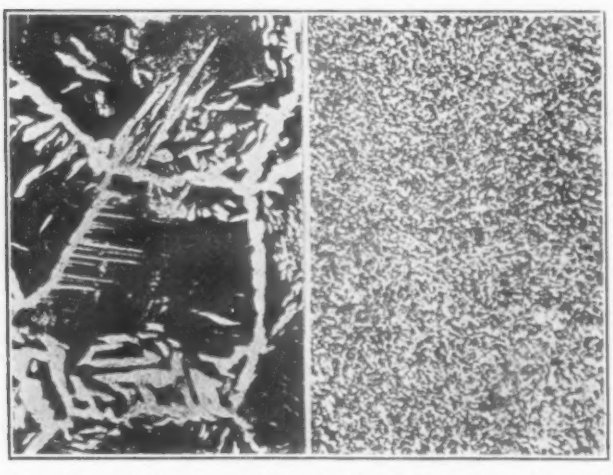


Fig. 10 — Photomicrographs (40X) of Steel Revealing the Definite Line of Demarcation Between Refined and Coarse Portions. See text for full explanation

The welded bar was reheated to a welding heat and forged down to ¾ in. square. It will at once be seen that this was really a case of making a weld with a minimum length of scarf, and that it was being subjected to less work than the Austrian welds, since the material was round instead of square. Several of these welds were made with the same result, and on subjecting them to tensile test and comparing them with the same material forged down to the same dimensions without welding, and then annealing them all together, it was found that in no instance was the welded bar less than the forged bar in either ultimate breaking load, elongation or contraction of area. Since the actual welded portion was evidently perfectly welded, this is not so very surprising, but nevertheless it is all the greater a proof that the welded bars were stronger than the original bars.

In every case the test piece broke at a point well removed from the actual weld; not only so, but without exception the test pieces under tension elongated and contracted on each side of the weld, finally breaking down at one side and leaving a thick portion at the center of the same dimensions as the test piece before testing. From the structure shown, and especially from that of the finished weld as shown in Fig. 9, this is just what should be expected. Fig. 9 represents one of the butt welds after forging down to the smaller size, although it appears as if it were a scarf weld from the angle of the line of junction. This is due to the fact that in this case the line of the weld has changed from its original position in the process of forging.

It has been mentioned that welded bars very frequently break down at a point outside of the actual welded portion because of the fact that the portions adjacent to the weld are nearly always heated to the same high temperature without receiving any work, but from the results of this research it would appear that here we have another reason which may prevail more often than we think. In the one case it is due to the weakening of the adjacent part; in the other it is due to the strengthening of the actual weld by reason of its really becoming a steel of higher carbon contents.

It is at once conceded that welds of this type are not made in practice, but I have described them at some length because they demonstrate conclusively that even without a scarf, welds can be made as strong as the original bar when all the conditions essential to perfect welding are fulfilled.

Necessity for Annealing

All welded material should be annealed, because, as has been previously noted, the parts adjacent are unavoidably raised to the same high temperature as the actual weld, and are consequently liable to be very coarsely crystalline and brittle. Annealing is in many cases thought to be merely a reheating to a dull red heat, but while this certainly does eliminate any hammer hardness and release any strains, it may not, depending on the carbon present, refine the structure of the steel. Just as in the case of the melting and welding temperature, the lower the carbon in the steel the higher will be the temperature for annealing. True annealing is the reheating to a definite temperature which varies with the carbon contents. Heating just a little short of that temperature causes no alteration in the structure. Almost immediately after passing the particular critical point a sudden change takes place.

This will be fully realized from the following experiment. A piece of steel containing about 0.49 per cent carbon was heated to a very high temperature short of burning and allowed to cool very slowly in order to secure the maximum grain sizes. When cold

it was divided longitudinally into three parts by means of groves on each side. One portion was snapped off under a hydraulic press, revealing a very coarsely crystalline fracture. The remaining portion was caught by a pair of tongs at the one end and was reheated at the other end in such a way as to have a gradually lessening temperature from about a yellow color at one end to about a black at the other end. When cold it was snapped as before, revealing a differential fracture. The most noticeable feature was the definite line of demarcation between the refined and the coarse portions. The photomicrographs, Fig. 10, represent portions on each side of the dividing line about $\frac{5}{8}$ in. removed from each other.

More might well be said about this most interesting subject of the welding of iron and steel, but what has been dealt with may suffice to emphasize the following important points:

Clean metallic surfaces must be secured.

To that end a suitable flux is indispensable, and welding should never under any circumstances be attempted without it.

Steel should never be subjected to mechanical work while at a temperature about that of incipient fusion.

The shape of the scarf should always be of such a nature as to facilitate the removal of all slag or ferrous silicate.

When possible the size of material should be sufficiently large to permit of the material being subjected to the proper amount of mechanical treatment.

Welded material should as far as possible be subjected to a proper annealing process.

Annealing should not be a mere form of heating at random, but should be carried out at a definite temperature in keeping with the requirements of the particular steel.

Welds may be made as strong as the original unwelded material if the craftsman thoroughly understands the fundamental principles of the process, and, believing it possible, aims at perfection with complete confidence in his ability to secure it.

I trust that I have succeeded in demonstrating the value of the co-operation of scientists and practical craftsmen. Much has been said of late regarding industrial research, and it is to be hoped that it may be carried out along the right lines. It is only by the proper combination of educational institutions, technical research laboratories and, last but not least, the workshop, that any real progress can be made, and in all investigations to be carried out the last-mentioned department should be well represented for two reasons—in the first place to state, since men are experienced there, the needs and the difficulties in order that these may be supplied and surmounted, and in the second place to determine, since they can only be fitly determined there, whether the conclusions mutually arrived at are practical or not. Much good work is being done in each of these institutions, but it is only by bringing them into intimate touch with each other that their full value will be secured, the effect of which would be inestimable in the industrial world.

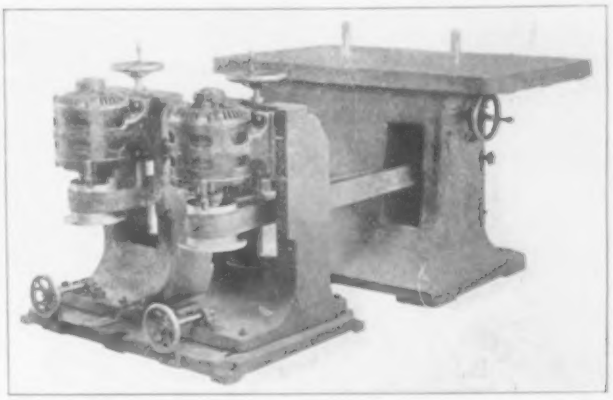
Limestone in 1917

The value of the limestone produced in the United States in 1917 increased $4,953,780 (12 per cent), but the quantity decreased about 3,770,000 net tons (6 per cent). The total output for 1917, as compiled from reports made by the producers to G. F. Loughlin, United States Geological Survey, Department of the Interior, was 63,465,000 net tons, valued at $46,263,379, and represented 76 per cent of the quantity and 56 per cent of the value of all stone quarried in the United States. The average price was 73c. a net ton in 1917, which was 11c. more than in 1916.

Though the condition of the iron trade during the first six months of 1917 indicated that a small decrease in the quantity of limestone marketed for use as furnace flux might be expected in 1917, the reports for the entire year show an increase, for the production was 25,574,146 gross tons, valued at $18,679,213, a gain of 1,950,638 gross tons (8 per cent) in quantity and $4,732,331 (34 per cent) in value over 1916. The average price was 73c. per gross ton, as compared with 59c. in 1916.

Novel Motor Drive for Double Spindle Shaper

The Oliver Machinery Co., Grand Rapids, Mich., has recently invented a novel and compact motor drive for double spindle shapers, using standard vertical motors. A separate motor, belted to each spindle, is mounted



Oliver Machinery Co.'s New Motor Drive for Double Spindle Shaper

on vertical gibbed ways, adjustable by hand wheels and screws so that each motor can be located at any height desired, shown by the scale, as may be called for by the raising or lowering of the shaper spindle to suit the work.

Each motor stand is independently adjustable to and from the shaper to suit the length of belt, to allow the use of a straight vertical belt and to take up the stretch so as to make belt tighteners and similar devices unnecessary. Either of the shaper spindles can be run independently by merely throwing out the switch for the motor operating the other spindle.

This new motor drive arrangement takes up a distance of only 5 ft. between centers, making the actual floor space about 5 x 7 ft., the only amount that is taken up by the machine. The arrangement uses standard vertical motors of any kind as called for by the electric current in the factory and can be supplied not only with new shapers but for shapers now in use. Any kind of starting units for the motors can be furnished.

Lower Prices Will Reduce Wages of Many Workmen

YOUNGSTOWN, OHIO, Dec. 23.—Reductions in wages of sheet and tin mill operatives will follow as a result of the new prices effective Jan. 1. The present wage agreement will not expire until July 1, 1919, between the mills and the Amalgamated Association of Iron, Steel and Tin Workers. As rapidly as lower prices are reflected in the sales sheets, reductions will follow. As independent concerns generally follow the Amalgamated scale, a similar reduction may be expected for operatives of these companies.

The Amalgamated wage scale provides that for each $1 per ton fluctuation in the price of sheets, wages are accordingly varied 1½ per cent, figured on the base. A $6 per ton cut therefore means that sheet mill men will sustain a wage reduction of 9 per cent on the base rate.

Wages of tinplate operatives fluctuate 1 per cent for each 5c. on the base box and the decline of 40c. per base box will mean an 8 per cent cut, also figuring on the base. As the selling price of both sheets and tinplate is now more than double that of the base rate price, actual wage cut for these operatives on their present earnings will be less than 5 per cent in each case.

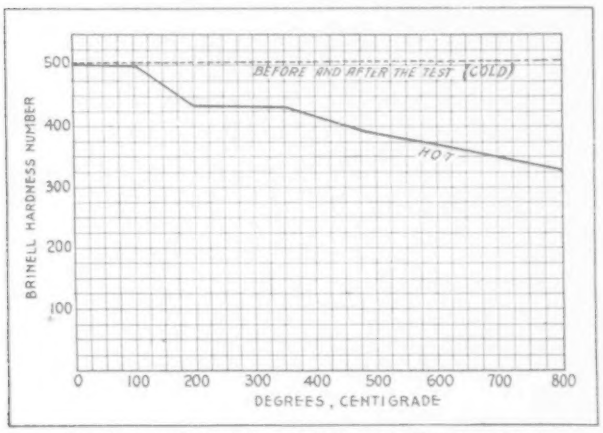
Wages of puddlers vary 25c. per ton for each 5c. a hundred pounds change in the price of bar iron. Wages of both puddlers and helpers will be affected if bar iron prices are cut.

It is estimated 30,000 sheet, tin and bar workers in the Middle West will be affected by the proposed changes.

Stellite and High Speed Steel Compared

Hardness at Different Temperatures — Stellite Softer in the Raw State — Relative Cutting Tests on Three Materials

THE *Revue de Metallurgie* in its July-August issue publishes a very interesting article on "Stellite," by L. Guillet and H. Godfroid. This wonderful alloy, discovered in 1899 by Mr. Haynes, is naturally well known to all Americans. Its use for cutting tools is becoming widespread, notwithstanding its high price.



Hardness of Stellite at Different Temperatures

It is a complex alloy of carbon, cobalt, chromium, tungsten and sometimes molybdenum. The stellite containing more than 10 per cent chromium is very hard and is filed only with difficulty.

A careful comparison was made under the conditions given below of the variation in hardness at different temperatures of stellite and a superior quality of high speed tool steel. The samples of each alloy were heated in the form of cubes in an electric furnace placed near the hardness testing machine. The temperature was measured by a newly standardized Le Chatelier thermocouple. The sample was heated to the test temperature plus 15 deg. C. and held there for 15 min. It was then removed and placed on a hot plate, surrounded by a sleeve of asbestos also heated, and covered with an asbestos plate. The ball of the Brinell machine, renewed for each test, was heated to about 200 deg. C. The diameter of the impressions was read with a microscope. The tables given below and the curves show the results obtained.

Table 1—Brinell Hardness of Stellite at Different Temperatures

Hardness Before Test	Temperature of Test, Deg. C.	Hardness While Hot	Hardness After Test
512	100	495	512
512	200	430	512
512	350	430	512
512	475	387	512
512	630	364	512
512	700	351	512
512	800	332	512

Table 2—Hardness at Different Temperatures of High-Speed Steel "A C"

Hardness Before Test	Temperature of Test, Deg. C.	Hardness While Hot	Hardness After Test
667	200	652	652
627	400	582	652
627	500	555	627
627	600	430	652
652	650	340	477
652	700	170	364
652	800	112	340

The high speed steel had been previously quenched from 1275 deg. C. in rape seed oil, and then reheated at 580 deg. C. for 40 min. in a lead bath. In this condition tools taken from the same steel allowed a cutting speed to be reached of 41.75 meters (137 ft.). The steel worked on was 90 mm. diameter (3.54 in.) of treated chrome-nickel steel with a tensile strength of about 142,000 lb. per sq. in. This steel contained 0.35 per cent carbon, 2.30 per cent nickel, 0.95 per cent chromium. The depth of cut was 0.059 in., the feed 0.014 in., the angle of the tool 8 deg., the side clearance 14 deg., the top clearance 8 deg., the cutting edge curved. The tool was 0.55 in. square, and no soap solution or other liquid was used.

The conclusions to be drawn from these hardness tests are that stellite is softer in its raw state than properly treated high speed steel. However, it retains its hardness much better above 600 deg. C. and, after cooling, its original hardness returns. In regard to high speed steel there is a sudden drop in the hardness when a temperature of about 600 deg. C. is reached. This may be stated as a general law, for it has been confirmed by numerous tests.

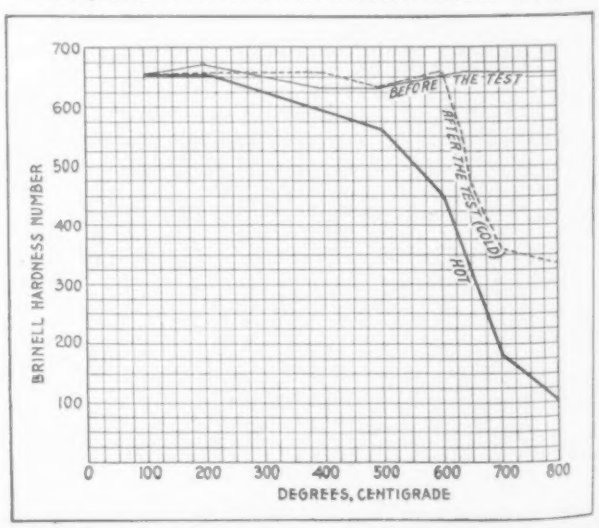
Several photo-micrographs are given in the original paper showing the structure of stellite as revealed by etching with concentrated hydrochloric acid containing 10 per cent bromine. In its original condition the alloy presents the ordinary dendritic structure of a cast metal, and shows two constituents. If it is heated to 1150 deg. C. and quenched in oil or hot water, the structure is not changed, nor the hardness, which remained 512 for the sample examined, tested under standard Brinell conditions (10 m.m. ball, 3000 kg. pressure). Attempts to normalize the structure were only successful after heating for six hours at 1000 deg. C., a preliminary heating for two hours not giving a satisfactory result.

Analyses show considerable variation in composition, which may be due to progress in manufacturing methods. For instance, analyses are given below of samples supplied in 1914 and 1917:

	1914 Sample, Per Cent.	1917 Sample, Per Cent.
Carbon	1.79	1.48
Silicon	0.78	0.17
Manganese	0.72	None
Cobalt	34.60	55.60
Vanadium	1.00	None
Chromium	26.36	33.60
Tungsten	12.70	9.15
Molybdenum	9.44	None
Iron	10.06	Traces
Sulphur	Not determined	0.01
Phosphorus	Not determined	Traces

Cutting tests were made with stellite on three classes of material: First, on a medium carbon steel quenched and tempered, having a tenacity of about 142,000 lb. per sq. in.; second, on a grey cast-iron of the following composition:

	Per Cent
Total carbon	3.22
Graphite	2.50
Silicon	1.80
Manganese	1.06
Sulphur	0.068
Phosphorus	0.663



Hardness of High Speed Steel at Different Temperatures

Third on a somewhat mottled cast iron with a small amount of free cementite. The outer surface of the bars was very hard, while the interior showed a grey fracture. The bars varied in diameter from 90 to 120 m.m. (3.54 to 4.72 in.), and were turned in a strong lathe with variable speeds. The cutting angles were the same as those previously given, the tools were 12 x 12 m.m. (0.47 in. square), held in a special tool holder, and their composition was the same as the 1917 sample given above. The depth of cut was always 0.059 in., the feed constant at 0.013 in., and no solution or water was used. The maximum cutting speed obtained on the steel was 66.10 meters (217 ft.), on the grey iron 54 meters (177 ft.), and on the mottled iron 30 meters (98.4 ft.).

It was not possible to test the stellite on softer steel because the lathe was not powerful enough. The best results were obtained with the alloy in its cast condition. After normalizing six hours at 1000 deg. C. the maximum speed on the medium steel was 30 meters (98.4 ft.).

These French investigators draw the conclusions that stellite is a most interesting alloy in that it may be used without any special treatment and even under these conditions gives better results than the best high speed steels actually on the market, at least used on the materials mentioned above. It has, however, the inconvenience of being heterogeneous, and the results obtained are not always constant. Further researches are under way to test the influence of each of the metals found in this alloy, the composition of which is singular, which they hope to publish in the future.

G. B. W.

Truscon Pressed Steel Parts

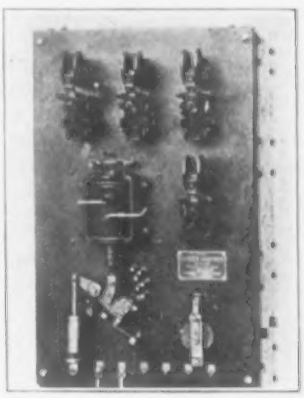
In recent years the manufacture of deep drawn, heavy stamping and pressed steel parts has increased tremendously. Many articles previously cast are now successfully and more satisfactorily formed from sheet or plate steel. Among the leading concerns in this business is the Truscon Steel Co., Youngstown, Ohio, which has been manufacturing pressed steel parts for a number of years, the greater part of such work having originally been for use in connection with its own specialties for buildings. Its products to-day practically cover the entire field of structural building materials.

The result of the attention thus necessarily given to pressed steel work is that the Truscon Steel Co. has built up a skilled organization and developed a very complete factory for this type of product. The men at the head of the pressed steel department have had long experience in this line. G. F. Danielson, manager of the department, has for 25 years devoted his entire efforts to the manufacture of pressed steel parts. This intimate knowledge of the business, with its efficient engineering force, places the company in position to give valuable suggestions to consuming manufacturers. Its large machine shops enable it to make the most intricate dies economically. The factory buildings cover an area of 12 acres, with 2½ miles of trackage on the grounds, furnishing ample sidings throughout the factory buildings proper and for all storage yards. Being located in the center of the steel district, the best possible service is secured on the delivery of raw materials, and the company is in excellent position to ship direct to any point.

The equipment in this plant is unusually complete, providing for a wide range of work. The many presses number into the hundreds and include the most prominent makes, ranging in capacity from small automatic to gigantic pressure machines. These batteries of presses are accompanied with a full complement of shearers, welders, shapers, lathes, grinders, drills, compressors and rolling, milling and screw machines. In fact, the variety of Truscon products has necessitated the development of a plant which proved of national value in the time of war. It furnished the Government with shells and booster casings in quantities, in addition to an unusual volume of pressed steel and heavy stamping work for manufacturers. The company is now entering this market and bidding for business on a broader scale than previously.

Self Starter Designed for Mines

The accompanying illustration shows a self starter for mine duty, manufactured by the Cutler-Hammer Manufacturing Co. of Milwaukee, designed for the continuous operation of such vital apparatus as ventilating fans or pump motors. This is a pilot switch accelerator type starter for motors up to 100 hp., and is equipped with a relay which it is claimed is sensitive and positive in its action. This relay is to guard against injury to the motor; it causes all of the armature resistance to be inserted in case of a bad drop in voltage, thus checking the heavy current resulting from the decreasing counter electro-motive force. If the line pressure falls to about 80 per cent of normal the relay drops out, opening the control circuits to the accelerating switches which drop in turn and cut into circuit the heavy duty starting resistance, which has capacity for continuous service at low voltage. The motor then runs at slow speed until the voltage increases and at about 90 per cent of normal the relay pulls in again, cutting out the resistance and permitting the motor to accelerate to normal full speed.



The Relay of this Self-Starter Guards Against Injury to the Motor by Causing All of the Armature Resistances to Be Inserted in Case of a Bad Drop in Voltage

A single coil overload, where shunt wound motors are used, can be added to also insert the armature resistance in case of an overload and thus keep the fan or pump going at a reduced speed. This single-coil overload and the voltage relay prevent the shunt motor from flashing over under severe voltage fluctuations. With a compound motor the overload is not so necessary because when the motor tends to run as a generator the compound winding opposes the shunt winding, thus neutralizing the field and preventing flashing over.

Cromwell Steel Co. Plants Will Resume

The Cromwell Steel Co., Lorain, Ohio, will place its 30-in. bar mill in operation Jan. 1. This has been shut down several months during which the plant has been supplying other producers with semi-finished steel on Government orders. Its open-hearth plant was shut down Dec. 14 but will start up Jan. 1.

The Traylor Cement Gun Construction Co., Allentown, Pa., organized by S. W. Traylor, president Traylor Engineering Co., will build a plant in France for the manufacture of the Traylor cement gun, to be used in reconstruction work in that country. A site is to be acquired in the manufacturing section of Paris, along the Seine River, and a plant will be erected to cost about $500,000. It is expected to commence construction work early in February, under the direct supervision of Mr. Traylor. Employment will be given to about 300 persons at the beginning. Plans are under way for the construction of large stone crushers, to be known as the Traylor gyratory crusher, at the works of the Traylor Engineering Co., Allentown, Pa. A contract has been received for the first of the new crushers, which will have a capacity of about 2000 tons per hour, pulverizing rock as large as 7 x 15 ft., and which it is said will be larger than any previous machine of its kind. The company has specialized in the construction of stone crushers of smaller type.

The Hess Steel Corporation, Baltimore, has established a branch office at 50 Church Street, New York. Daniel V. Foster, who is now representing the corporation in that district, will be in charge.

Industrial Training in Army Service*

Administration, Organization and Foundation Principles—Methods of Instruction in Various Trades—After-War Results

BY C. R. DOOLEY

THE run of the draft only partially supplies the number of trade specialists needed by the army. I recently visited the field artillery replacement depot at Camp Taylor and found that the personnel officer there is able to get just one-half the required specialists from the draft. He looks to the committee on education and special training for the balance. The records of the personnel officers throughout the camps show that less than 10 per cent of the men have had a high-school education or better and that the great majority have had no special training of high degree, and lack skill or even any continuity of experience.

The committee on education and special training was appointed in February, 1918, to train men for the service. First of all the men must be soldiers, disciplined to prompt and complete obedience and broken into the routine of army life; second, they must be skilled in those trade specialties needed in the army; third, they must have that originality and initiative as soldiers to use the tools and materials at hand in emergencies. These men are an organization of soldiers possessing special trade ability as an additional equipment.

The needs of the service often require new combinations of the standard trades. For example, a machinist on a mobile repair shop of the ordnance department must be able to do gas welding and to maintain the electrical generator and motors in good repair. The degree of skill must agree with army requirements. For example, carpenters are required in large numbers to build barracks, dugouts, simple bridges, etc., but only very few are needed to do interior finishing or cabinet work. So the committee set up a program about as follows: Military training; sorting and training according to ability; trade fundamentals and combinations; development of originality and initiative. Two months were allowed as the length of each course and six months, April 15 to Nov. 15, assigned to the experiment. A total of 90,000 men were assigned to the committee to be trained. A production chart showed the capacity necessary for each day in order to meet the 90,000 by Nov. 15 and at the same time the field men were instructed to contract only with those places well equipped and willing to do the work. No greater evidence of American resourcefulness has been developed than that of the 140 odd schools in their radical changes of equipment, methods, and policies to meet this emergency. The production chart was eagerly watched day by day until the danger line was passed and we are closing up the experimental period with a total of approximately 100,000 men trained in some 30 trades.

Methods of Instruction

Preliminary results warrant faith in the methods pursued—methods needing refinement, yet fundamentally sound.

Three hours a day were devoted to infantry drill, military courtesy, inspection and general military training, to break in green men and develop habits of promptness, precision, order and a company spirit in place of the normal American individual spirit. The spirit of this training was such that the men felt inspired by enthusiastic leadership rather than driven by superior authority. Both the experience and the natural aptitude of each man were used as a foundation. If a man has made a success at a given work the chances are favorable for giving him further special training in the same line.

Circumstances have often prevented men from following their natural talents. Such cases are by no means the exception, for example: At the Dickinson High School of Jersey City over 60 per cent of the men came from the lower east side of New York: sweat shop workers, garment workers, toughs, gunmen, men from the docks, teamsters and every kind except men from the mechanical trades; men who had never been in an industrial shop; never handled a shop tool nor even a foot-rule and who seemed hopeless for training. They were assigned to classes and in a few days there was a remarkable change. Due to admirable military discipline and the efficient shop instruction some 360 "fighting mechanics" were delivered to the army. We were proud of these men when they left after the eight weeks of training; these men who had acquired the ability to do a real job and who also were trained soldiers. One must live through an experience of this kind, in order to realize the remarkable, almost miraculous change that can be effected in men through this combined military and vocational training.

Satisfactory Results Obtained

A class of 200 men reporting for instruction in general electrical repair and construction work at Bliss Electrical School appeared to be hopeless in point of previous experience. One man, 30 years of age, had come from a real estate concern where he had been responsible for the legal operations. It was urged that this man be transferred to where his experience could be used immediately. Within 10 days the report came that he was so interested in electrical work that he preferred not to change and near the end of the period the class as a whole had made greater progress than any class the principal had ever had in civilian life doing the same work in the past 25 years. At the University of Pittsburgh a young man came directly from the farm where he had had no experience whatsoever with sheet metal work. His education was merely that of the common school. In six weeks' time he was making stove pipe elbows of commercial quality from patterns which he himself developed by sound principles of descriptive geometry. In this particular school the instruction was given right in the machine shop where the making of the pieces and the principles of projection and intersection were learned in a manner which made them a part of this young man's consciousness rather than by merely memorizing methods. One of the inspiring things about these and hundreds of other incidents is the fact that the men themselves are enthusiastic about continuing with some form of industrial work even after the war.

Evidently the classification of men cannot be based too completely upon their experiences, and full consideration must be given to their latent native abilities. With the best classification, all men will not be able to follow a single schedule with equal success. Schedules, therefore, must be progressive rather than circular and based on achievement rather than length of time. In the army each man is rated, not by the per cent grade at which he can perform over a complete list of prescribed jobs, but by the actual list of jobs he can do well.

Many of the tasks in the army do not completely follow the standard lines of industrial occupation and it was therefore necessary to define the duties in terms of the work to be done which often included certain very definite combinations of parts of standard trades.

*From a paper presented at the annual meeting, Dec. 3-6, in New York, of the American Society of Mechanical Engineers. The author is educational director, vocational instruction, committee on education and special training, War Department.

For example, the operator of a mobile machine shop for the ordnance department must be able to operate a small lathe, a small drill press and do small vise and bench work. Further, he must be able to do gas welding, especially on thin-metal parts and must maintain in operating condition a gas-engine-driven electrical generator and the several electrical motors. Such an operator is called a machinist, although a machinist ordinarily could not fill the bill. This emphasizes the great value of the man who can handle several different trades. He cannot become thoroughly skilled in all the phases, but by limiting the instruction to the fundamentals several allied trades may be covered, adding greatly to a man's usefulness.

Among other things that have been shown by the war to be advantageous is that type of efficiency which reckons on the personal originality of each man rather than on the completeness of the detail of his instructions, of a type of training that is flexible and elastic rather than rigid and exact in all predetermination. The job not only serves for the development of originality but for the discriminative acquisition of special knowledge. In the final analysis one of the chief objectives of this training is to compel each man to use his own initiative and originality.

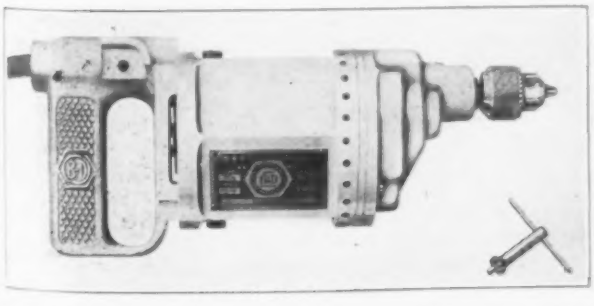
After the War Results

The war is over. Thousands of men will return to industry with keen, alert minds, disciplined to act promptly and thoroughly as members of a team rather than as individuals. Many will not be highly skilled in civil occupations and will have to be trained in special work, but they will learn quickly and will advance rapidly because of their military experience. The committee on education and special training could operate its organization backward, so to speak, and train the returned soldiers for industrial work during the process of demobilization if such a plan were approved.

In closing, may I state that industrial training means vocational skill, plus imagination and initiative, plus the discipline of keen service, which marks the beginning of true leadership? It is hoped that the work of the committee has contributed to the cause of general education in establishing some evidence of the fact that military training and vocational or academic training supplement each other; and in holding up before all students the motive of production for the community rather than for individual profit.

B. & D. Portable Electric Drill

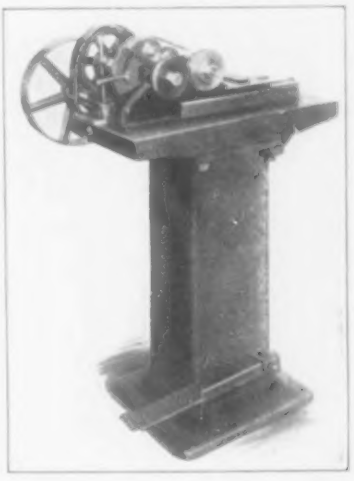
A number of improvements have been incorporated in the B. & D. portable electric drill. Of these probably the most radical is a pistol grip and trigger switch, enabling the operator to turn the current on or off without removing either hand, a time-saving feature that is also a valuable safeguard against broken bits and inaccurate work. The drill is light in weight, automatically cooled and, it is claimed, perfectly balanced. Bearings are grease lubricated by a capillary system. The motor is of a special compensating type using either a.c. or d.c. current. The drill is built in sizes from 3/16 to ⅞ in. by Black & Decker Mfg. Co. of Baltimore.



The Pistol Grip and Trigger Switch permit of controlling the drill without removing the hands—a safeguard against broken bits and inaccurate work.

Special Graduating and Marking Machine

A machine has been designed and built by the Noble & Westbrook Mfg. Co., of Hartford, Conn., for fine graduating where speed and accuracy are required. It is power driven, the handling of pieces to and from the machine is the only labor required. The work is held in a proper relation to the die with accurately cut gears and the depth of the impression is determined by a foot lever, cam and weight coming to a position stop, adjustable to any desired depth of line. This assures even and correct results. The machine has steel spindles, adjustable bearings and full automatic action, and is controlled by a clutch on the spindle driving the die. The class of work done by this machine is also illustrated. The different diameters are graduated by changing the position of the intermediate gear on the adjustable sector. This machine is an addition to the line of Dwight slate marking machines. Graduated and numbered elements are more than ever essential on modern machinery for micrometer and other adjustments that save time and promote accuracy and output. Illustrating the character of work done by the machine may also suggest further uses of the product capable of being handled by it to advantage.



Special Machine for Power Graduating and Numbering Built by the Noble & Westbrook Mfg. Co.

Specimens of Work Done by the Graduating and Numbering Machine

Labor in several Central Western cities is showing an independent spirit hardly in accord with the times, and in the case of two or three foundries where the men have gone on strike for advances in wages, the advice has been given that the plants shut down for two or three weeks. From every direction comes word of men being laid off as the war activities cease. At Davenport, Iowa, iron workers went on strike early in the month, their demand being for 90c. per hr. and an 8-hr. day. They have been receiving 73½c. an hr. In the case of one or two foundries the men have just been advanced from $5.50 to $6 per day.

The Taylor-Wilson Mfg. Co., McKees Rocks, Pa., is rebuilding its foundry which was burned recently. The fire did not damage the machine shop, and a great deal of work which was in process will not be interfered with. This company manufactures special machinery, including gears and tube-mill equipment.

Working Conditions for Women Prescribed

Belated Statement Comes from Department of Labor, Which Expected to Use War Powers—Delay Due to Wrangling

WASHINGTON, Dec. 17.—Just one month after the cessation of hostilities, the Department of Labor issued its recommendations for "Standards for the Employment of Women."

Nothing has furnished so much evidence of the internal conflicts of this Department as the bickerings which have centered about the question of woman labor. It was this struggle within the Department which hampered seriously the efforts of American industry to use women in the replacement of soldiers in the vital days of the war, when every ounce of human energy was of supreme importance. At that time even the appeals of the War Industries Board failed to stir the Labor Department to action or to halt the conflicts which paralyzed its activities. This correspondence has already told of the months of delays which petty controversies caused in the addition of women representatives to the community labor boards.

But the paralysis of the Department as it related to woman labor standards was complete. The standards themselves were drawn up early in the fall. At that time the employment of woman labor was at its height. Hundreds of thousands of them were being added to our industrial army. Recommendations for standards would have been accepted without complaint by employers. It was a time singularly propitious for such an announcement.

The statement was, in fact, formally drawn up. In the last week of October it was even sent out as an official document. But the departmental politics had to have its innings. Petty personal controversies forced a recall of the document. And the bickering began anew. As far as can be learned, no vital question of principle was at stake. Then the signing of the truce in Europe took away from the Department almost all power of enforcing the standards it was preparing to set up. The schedule issued now must be left to the voluntary co-operation of the industries concerned.

In the following statement of the standards recommended by the Department of Labor the portion printed in small caps represents the more vital requirements. Had the Department issued this before the signing of the armistice, it was prepared to attempt the enforcement of these sections by the summary use of its war powers. Now it can only underline them as "important." The Department's program of standards follows:

I. Hours of Labor

1. *Daily Hours.* NO WOMAN SHALL BE EMPLOYED OR PERMITTED TO WORK MORE THAN EIGHT HOURS IN ANY ONE DAY OR 48 HOURS IN ANY ONE WEEK. THE TIME WHEN THE WORK OF WOMEN EMPLOYEES SHALL BEGIN AND END AND THE TIME ALLOWED FOR MEALS SHALL BE POSTED IN A CONSPICUOUS PLACE IN EACH WORK ROOM AND A RECORD SHALL BE KEPT OF THE OVERTIME OF EACH WOMAN WORKER.

2. *Half Holiday on Saturday.* Observance of the half-holiday should be the custom.

3. *One Day of Rest in Seven.* EVERY WOMAN WORKER SHALL HAVE ONE DAY OF REST IN EVERY SEVEN DAYS.

4. *Time for Meals.* AT LEAST THREE-QUARTERS OF AN HOUR SHALL BE ALLOWED FOR A MEAL.

5. *Rest Periods.* A rest period of ten minutes should be allowed in the middle of each working period without thereby increasing the length of the working day.

6. *Night Work.* NO WOMAN SHALL BE EMPLOYED BETWEEN THE HOURS OF TEN P. M. AND SIX A. M.

II. Wages

1. *Equality with Men's Wages.* WOMEN DOING THE SAME WORK AS MEN SHALL RECEIVE THE SAME WAGES WITH SUCH PROPORTIONATE INCREASES AS THE MEN ARE RECEIVING IN THE SAME INDUSTRY. Slight changes made in the process or in the arrangement of work should not be regarded as justifying a lower wage for a woman than for a man unless statistics of production show that the output for the job in question is less when women are employed than when men are employed. If a difference in output is demonstrated, the difference in the wage rate should be based upon the difference in production for the job as a whole and not determined arbitrarily.

2. *The Basis of Determination of Wages.* WAGES SHOULD BE ESTABLISHED ON THE BASIS OF OCCUPATION AND NOT ON THE BASIS OF SEX. THE MINIMUM WAGE RATE SHOULD COVER THE COST OF LIVING FOR DEPENDENTS AND NOT MERELY FOR THE INDIVIDUAL.

III. Working Conditions

1. *Comfort and Sanitation.* State labor laws and industrial codes should be consulted with reference to provisions for comfort and sanitation. Washing facilities, with hot and cold water, soap and individual towels, should be provided in sufficient number and in accessible locations to make washing before meals and at the close of the work day convenient. Toilets should be separate for men and women, clean and accessible. Their numbers should have a standard ratio to the number of workers employed. Workroom floors should be kept clean. Dressing rooms should be provided adjacent to washing facilities, making possible change of clothing outside the workrooms. Rest rooms should be provided. Lighting should be arranged that direct rays do not shine into the workers' eyes. Ventilation should be adequate and heat sufficient. Drinking water should be cool and accessible with individual drinking cups or bubble fountain provided. Provision should be made for the workers to secure a hot and nourishing meal eaten outside the workroom, and if no lunch rooms are accessible near the plant, a lunch room should be maintained in the establishment.

2. *Posture at Work.* Continuous standing and continuous sitting are both injurious. A seat should be provided for every woman employed and its use encouraged. It is possible and desirable to adjust the heights of the chairs in relation to the height of machines or work tables, so that the worker may with equal convenience and efficiency stand or sit at her work. The seats should have backs. If the chair is high, a foot rest should be provided.

3. *Safety.* Risks from machinery, danger from fire and exposure to dust, fumes or other occupational hazards should be scrupulously guarded against by observance of standards in State and Federal codes. First aid equipment should be provided. Fire drills and other forms of education of the workers in the observance of safety regulations should be instituted.

4. *Selection of Occupations for Women.* In determining what occupations are suitable and safe for women, attention should be centered especially on the following conditions which would render the employment of women undesirable if changes are not made:

A. Constant standing or other postures causing physical strain.

B. Repeated lifting of weights of 25 lb. or over, or other abnormally fatiguing motions.

C. Operation of mechanical devices requiring undue strength.

D. Exposure to excessive heat, that is, over 80 degrees, or excessive cold, that is, under 50 degrees.

E. Exposure to dust, fumes, or other occupational poisons without adequate safeguards against disease.

5. *Prohibited Occupations.* WOMEN MUST NOT BE EMPLOYED IN OCCUPATIONS INVOLVING THE USE OF POISONS WHICH ARE PROVED TO BE MORE INJURIOUS TO WOMEN THAN TO MEN, SUCH AS CERTAIN PROCESSES IN THE LEAD INDUSTRIES. Subsequent rulings on the dangerous trades will be issued.

6. *Uniforms.* Uniforms with caps and comfortable shoes are desirable for health and safety in occupations for which machines are used or in which the processes are dusty.

IV. Home Work

1. NO WORK SHALL BE GIVEN OUT TO BE DONE IN ROOMS USED FOR LIVING OR SLEEPING PURPOSES OR IN ROOMS DIRECTLY CONNECTED WITH LIVING OR SLEEPING ROOMS IN ANY DWELLING OR TENEMENT.

V. Employment Management

1. *Hiring, Separations and Determination of Conditions.* In establishing satisfactory relations between a company and its employees, a personnel department is important, charged with responsibility for selection, assignment, transfer or

withdrawal of workers and the establishment of proper working conditions.

2. *Supervision of Women Workers.* Where women are employed, a competent woman should be appointed as employment executive with responsibility for conditions affecting women. Women should also be appointed in supervisory positions in the departments employing women.

3. *Selection of Workers.* The selection of workers best adapted to the required occupations through physical equipment and through experience and other qualifications is as important as the determination of the conditions of the work to be done.

VI. Co-operation of Workers in Enforcement of Standards

1. THE RESPONSIBILITY SHOULD NOT REST UPON THE MANAGEMENT ALONE TO DETERMINE WISELY AND EFFECTIVELY THE CONDITIONS WHICH SHOULD BE ESTABLISHED. THE GENUINE CO-OPERATION ESSENTIAL TO PRODUCTION CAN BE SECURED ONLY IF DEFINITE CHANNELS OF COMMUNICATION BETWEEN EMPLOYERS AND GROUPS OF THEIR WORKERS ARE ESTABLISHED. THE NEED OF CREATING METHODS OF JOINT NEGOTIATION BETWEEN EMPLOYERS AND GROUPS OF EMPLOYEES IS ESPECIALLY GREAT IN THE LIGHT OF THE CRITICAL POINTS OF CONTROVERSY WHICH MAY ARISE IN A TIME LIKE THE PRESENT. EXISTING CHANNELS SHOULD BE PRESERVED AND NEW ONES OPENED IF REQUIRED, TO PROVIDE EASIER ACCESS FOR DISCUSSION BETWEEN EMPLOYER AND EMPLOYEES.

"In recognition of the national importance of women's work and its conditions," says the department's announcement, "the Federal Government calls upon the industries of the country to co-operate with State and Federal agencies in maintaining the standards herein set forth as a vital part of the reconstruction program of the nation. These standards have been adopted by the War Labor Policies Board.

"The United States Government and State and local communities have established agencies to deal with conditions of labor, including standards of working conditions, wages, hours, employment and training. These should be called upon for assistance, especially in the difficult problems of adjustment in the period of reconstruction following the war. Inquiries regarding the employment of women may be addressed to the Woman in Industry Service, Department of Labor, Washington, and these will be dealt with directly or referred to the official Federal or State agency best equipped to give the assistance needed in each instance."

O. F. T.

Boiler Manufacturers' Meeting

A special meeting of the American Boiler Manufacturers' Association was held at the Hollenden Hotel, Cleveland, Dec. 16, to discuss the problem of reconstruction as applied to the boiler-making industry, following out the work in respect to this industry that was taken up in a general way at the recent Atlantic City conference. About 30 members attended the meeting, which was presided over by W. C. Connelly, Cleveland, president of the organization.

After discussing at some length reconstruction work and the outlook for the future, the association decided to continue its War Service Committee as a Reconstruction Committee. This committee will attend the meeting which will be called next month by H. A. Wheeler, president Chamber of Commerce of the United States.

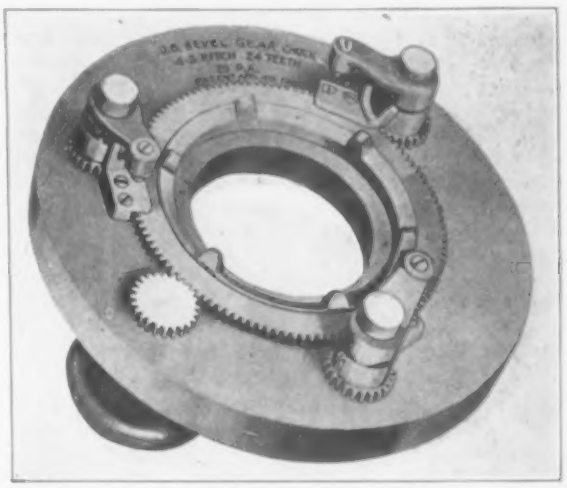
The chair was authorized to appoint a committee to work out a uniform cost finding. This committee, which will be appointed in a few days, will report at a special meeting of the association to be called within the next 60 days.

The subject of cancellations of contracts was brought up and the association voted its approval of the Government's policy in regard to cancellations as outlined in a communication recently sent out by General Goethals. As boiler manufacturers are largely engaged in work for the Emergency Fleet Corporation, they have not suffered so much from cancellations as some other industries. According to reports made at the meeting, approximately 10 per cent of the orders on the boiler manufacturers' books have been canceled.

O. G. Chuck for Bevel Gears

This chuck is for the rapid chucking of bevel gears, true with the pitch diameter, for the grinding or any remachining of holes, or other parts of gears, the actual chucking time of a gear of 6 in. pitch diameter being five seconds.

No measuring, truing up, indicating or experience is required of the operator. On turning a knob on the back of the chuck (after inserting the gear), the work



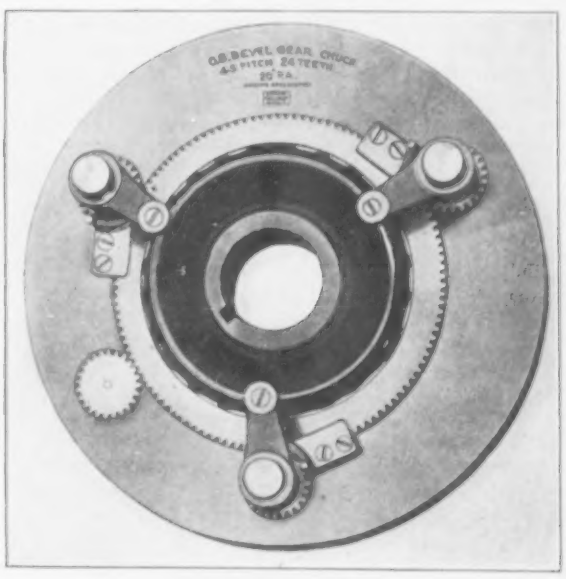
O. G. Chuck Designed for Accurate and Rapid Chucking of Bevel Gears. Chuck is shown ready to receive gear

is automatically located true and clamped rigid.

In chucking a gear, the clamps are all turned simultaneously into a radial position over the gear and gripped by rotating the knob to the right. Turning the knob to the left loosens all clamps, turns them out of the way of the gear, and raises and holds them.

Similar chucks are made for spur, helical or skew bevel gears and pinions. It is claimed they chuck accurately and rigidly, thereby saving many gears heretofore lost in the grinding due to the holes not having been ground concentric with the pitch diameter.

Putting unequal pressure on any clamp is avoidable, as the clamps are simultaneously operated and are brought down on the gear by a very light coil spring inside of the hollow stud on which the clamp is mounted. The rear or outer end of a clamp is brought down over the stud by a spring inside of the stud until the point or inner end comes in contact with the gear. The



Chuck with Gear in Position

clamps, being a free fit on the studs, cannot be raised by pressure applied at their inner end on account of the cocking action of the clamp on the stud.

These chucks are manufactured by the Garrison Machine Works, Dayton, Ohio.

SUPPLIES OF FERROMANGANESE

Domestic Output Still Making Records—Supply Exceeds Estimated Consumption—Large Spiegel Production

Still more striking records have been made in the domestic output of ferromanganese and spiegeleisen since the last review of the status of this industry was published in THE IRON AGE, July 25, 1918. That statement covered the first half of the year and showed the May output of ferromanganese, 35,790 gross tons, to have been the largest ever recorded. This record has now been exceeded by the November output of 36,337 tons, and the showing for the past five months considerably surprises that for the first six months of 1918.

The production of spiegeleisen is also record breaking, the average monthly output in the last five months having more than doubled that of the first half, the record month being September, when 38,805 tons was made. The largest previous record was 23,079 tons in May, 1917. The data for both ferromanganese and spiegeleisen are compiled from the monthly blast-furnace reports of THE IRON AGE. The following table gives the output of domestic manganese-iron alloys for 1918 to Dec. 1, with a summary of other periods:

Domestic Output of Manganese-Iron Alloys in Gross Tons

1918	Ferromanganese	Spiegeleisen
July	31,400	20,362
August	31,065	30,466
September	27,480	38,805
October	35,092	35,487
November	36,337	23,301
Average per month, July to December, 1918	32,275	29,684
Average per month, first half, 1918	26,670	12,509
Average per month in 1917	23,833	16,107
Average per month in 1916	18,461	.....
Average per month in 1913	9,958	.....
Five-year average, 1910 to 1914	8,280	.....

The average monthly output of ferromanganese in the last five months has been 32,275 tons per month against 26,670 tons per month in the first half of this year and 23,833 tons per month in all of 1917. The total output for the eleven months of this year has been 321,399 tons or 29,218 tons per month. In 1913 our domestic output was only 119,496 tons or 9958 tons per month. The average monthly output of spiegeleisen was 29,684 tons in the last five months to December with the average for the first half at 12,509 tons per month, an increase of almost 150 per cent.

Available Supplies

The present situation as to available supplies is shown by the following table of output, imports and exports, in gross tons, in 1918:

1918	Output	Imports	Exports	Available Supply
July	31,400	3,952	351	35,001
August	31,065	3,743	284	34,524
September	27,480	102	234	27,450
October	35,092	200	52	35,240
November	36,337	....†	....†	36,000*
Average per month July to December, 1918	29,218	....	....	31,287*
Average per month first half, 1918	26,670	3,079	426	29,324
Average per month in 1917	23,833	3,703	776*	27,457

*Estimated. †Not yet reported.

These figures show that the available supply, or the exports deducted from the total of the output and imports, advanced from 29,324 tons per month at the end of the first half of this year to about 31,200 tons on Dec. 1, 1918.

The effect on the curtailment of importation from England is seen in the dwindling of this source of supply to insignificant amounts. The monthly average imports in 1913 were 10,672 tons per month, and they had fallen to 3703 tons per month in 1917. Since August the imports have been negligible.

Manganese Ore Imports

Supplies of imported manganese ore have been quite ample in 1918, though not as large as in previous recent years, due to import restrictions. The following table reveals the 1918 situation to November as compared with other years:

Monthly average first half of 1918	10,300
Monthly average July to October, 1918	16,262
Monthly average first 10 months, 1918	13,138
Monthly average in 1917	22,499
Monthly average in 1916	15,027
Monthly average in 1915	26,722
Monthly average in 1913	28,253

The volume of imports thus far in 1918 has been larger than the restriction in imports might have led one to expect and the inflow has been greater in the latter part of the year than in the first half.

Ferromanganese Supply and Needs

Not long after the United States entered the war an official estimate placed the monthly needs of the steel industry at 28,000 tons of ferromanganese. This was based on the use of 80 per cent alloy. The foregoing analysis shows an average available supply of 31,287 tons per month up to December, 1918. Assuming the 1918 steel output to be close to 45,000,000 tons and that 74 per cent of this is open-hearth steel, as in 1916, with two-fifths of the Bessemer output absorbing spiegeleisen as high carbon steel, the following calculation gives the estimated amount of 70 per cent ferromanganese necessary this year at 19.5 lb. per ton of steel produced instead of 17 lb. per ton of 80 per cent alloy.

		Gross Tons	
45,000,000 × 74	=	33,300,000	open-hearth steel.
45,000,000 — 33,300,000	=	11,700,000	Bessemer steel.
11,700,000 × 2/5	=	4,680,000	high carbon Bessemer steel.
11,700,000 — 4,680,000	=	7,020,000	low carbon Bessemer steel.
33,300,000 + 7,020,000	=	40,320,000	steel requiring ferromanganese.
40,320,000 × 19.5 = 786,240,000 lb.	=	351,000	ferromanganese necessary in 1918

Adding to the above 351,000 tons the 10,000 tons estimated as needed in the iron foundry business, we have 361,000 tons of 70 per cent alloy as necessary for our needs. To meet this total we have the probable available supply of 375,444 tons (31,287 x 12) as an available supply of 70 per cent alloy if the monthly average for the 11 months of this year is maintained for December. Allowing for the usual indiscretions in an estimate of this kind and the use of spiegeleisen as a partial substitute, the apparent surplus is about three weeks' supply of alloy.

Similar reviews of the manganese-alloy situation appeared in THE IRON AGE Dec. 6, 1917, Jan. 31, 1918, April 11, 1918, and July 25, 1918.

Mineral Production for 1917

The value of the minerals produced in the United States in 1917, according to the United States Geological Survey, Department of the Interior, was $5,010,948,000, an increase of $1,496,976,000, or about 43 per cent over the former record—$3,513,972,000—established in 1916. The blast furnace products (pig iron and ferroalloys), copper, coal and petroleum contributed 74 per cent of the total value of minerals produced and 88 per cent of the increase in 1917.

The metals established a new record in 1917, being valued at nearly $2,092,000,000 and representing 42 per cent of the total value of the mineral product. They showed an increase of about $471,316,000, or 29 per cent, over the $1,620,508,000 reported for 1916. The blast furnace products contributed nearly 90 per cent of the total increase. Increases were also made in the value of aluminum, copper, lead and silver, but decreases were recorded in the value of gold and zinc.

Receivership of the Cashman Tool Co., Waynesboro, Pa., has been terminated and the company reorganized. J. Raymond Hoy is now president; Thomas J. King, vice-president; Adrian J. Grape, secretary and treasurer. C. J. Huff was receiver.

THE SOUTH CHINA TRADE

Opportunities for Business in Steel and Machinery—Character of Requirements

Following are abstracts from a report to the Department of Trade and Commerce, Ottawa, Canada, by Trade Commissioner L. D. Wilgress:

There is a good opening for the extension of trade with Hong Kong in iron and steel and other metals and machinery. Great Britain and Germany were formerly large suppliers to the Hong Kong market, but as a result of war conditions, increasing dependence has been placed upon North America. It is probable that this part of the world will continue to be the main source of supply for some years to come. Wire nails have been practically the only considerable export from Canada to Hong Kong market in the past, but lately representatives from certain Canadian mills have visited the colony and established important connections. The current needs of the population and the increasing railroad and industrial development of South China will require the importation of a large quantity of iron and steel and other metallic goods into Hong Kong.

Practically all the standard forms of iron and steel are imported, but a particularly large business is done in such lines as plates, bars, rods, hoop steel, wire nails, etc. Wire nails are usually supplied to South China in kegs of one picul (133 1/3 lb., avoirdupois) net weight.

It is important for exporters of iron and steel products to the Hong Kong market to bear in mind that the trade is regulated by the practices and customs prevailing in Great Britain and other European countries. As an instance, prices for iron and steel products are always based on net weight, no allowance being made for packing or shorts. The conditions laid down in the indents should be followed closely, as otherwise the importer will be caused a great deal of unnecessary vexation and disappointment.

Interesting Details of Chinese Imports

The following summary of the chief assortments in the list of a Hong Kong importing firm will give exporters some indication of the principal iron and steel requirements for South China:

Countersunk chequered-head wire nails in kegs of one picul net weight, pitch paper lined, with heads cleated, and with two steel wire hoops and two steel flat hoops.

Galvanized wire packed in coils, each one picul net, and four small coils in a larger coil, wrapped in paper and burlap.

Galvanized mild steel hoops, cooperage quality, made up in scroll bundles of 56 lb. net tied with mild steel hoop cuttings.

Galvanized wire cuttings in lengths of 10 fathoms and up packed in coils of 112 lb. and wire tied.

Mild hoop steel cuttings packed in coils tied with cuttings, 5 ft. and up.

Mild steel bar ends, 3 ft. and up, tied in bundles of about 112 lb.; price per cwt. of 112 lb.

New galvanized-wire cuttings in about 100-ft. lengths, packed in coils of about 112 lb., in gunny.

Galvanized-wire shorts in catchweight bundles of 112 lb., unwrapped.

Galvanized mild-steel sheets (plain) per case of 560 lb.; price per cwt. of 112 lb.

Plain bamboo steel in one picul cases, lengths of about 78 in.

Steel-plate cuttings per ton (2240 lb.).

Round mild steel bars, 20 to 22 ft. long, shipped loose; price per ton of 2240 lb.

Round mild steel bars 18 to 20 in. long, price per picul (in bundles of about one picul net, balance loose for small sizes).

Flat mild steel bars, 18 to 20 in. long, price per picul (small sizes in bundles of about one picul net, balance loose).

Square, round and flat mild steel bars, price per picul (small sizes in bundles of one picul net, balance loose).

Round mild steel rods, about 12 ft. long, packed in bundles of about 56 lb.; price per ton of 2240 lb.

Square mild steel rods, about 12 ft. long in bundles of about 56 lb.; price per ton of 2240 lb.

Chequered plate or floor plate, sheets shipped loose.

Steel joists, unpainted; price per ton of 2240 lb.

Bright medium hard Bessemer wire in 16-lb. coils in paper, packed in tin-lined casks of 20 coils.

Square iron rods (similar to Belgian "sohier" nail rods), 6 ft. long, packed in bundles, each 56 lb., tied with four iron hoops.

Half oval mild steel bars about 12 ft. long in bundles of about 50 lb.; price per ton of 2240 lb.

Mild steel plates.

Black steel sheets, 30 in. wide by 72 in. long, packed in bundles of about one picul.

Black mild steel hoops, in bundles of about 56 lb., folded long fold and tied with two wires, smaller sizes in coils.

Chinese Industrial Developments

In addition to the lines enumerated above there is a demand in Hong Kong for iron and steel castings, pipes and tubes and all kinds of worked up iron and steel products. Special mention should be made of the requirements of the dockyard and shipbuilding companies, which have always been considerable. With the enlargement of the shipbuilding facilities there will be a greatly increased demand for all forms of iron and steel and other metal products used in that connection.

The development of industries in South China will result in a demand for all kinds of machinery and appliances. Inquiries were received both at Hong Kong and Canton as to the possibility of Canada supplying machine tools and metal-working and wood-working machinery. Owing to geographical and other advantages, the colony is sure to become an industrial center. Manufacturing in Canton also promises to be important in the future. A great number of small metal-working and wood-working establishments have started up in recent years, and this has led to a demand for machines and machine tools. The same may be said to apply in a smaller degree to the various other towns in South China. Electric light and power plants are being planned all over South China, and most of those already in operation require replacing or overhauling.

Canadian and other exporters of machinery desirous of doing business with China should imitate the example of the German firms who were successful in this particular field. A group of non-competing manufacturers should combine to establish a central office at Shanghai, and a staff of native engineers and agents should then be organized to cover the country and investigate conditions. In this way the central office can be kept informed as to probable openings for the sale of machinery and the particular requirements of the various districts. There should be two capable engineers—one electrical, the other general—to travel about the country demonstrating the machines. It is not possible to sell machinery to the Chinese by catalog or pictorial representation, since the Chinaman prefers to see the actual machinery in motion before purchasing. Manufacturers of machinery, by co-operating and sharing expenses in the above way, can most effectively cover the China market at minimum expense to each participant.

Award of the John Scott Legacy Medal and Premium

The City of Philadelphia, acting on the recommendation of the Franklin Institute, recently awarded the John Scott Legacy Medal and Premium to Frank P. Fahy, of New York City, for the Fahy permeameter. With this instrument accurate measurements for commercial purposes may be made with ease of manipulation. The coil which receives the specimen to be tested is of such a shape that long specimens, such as rods and bars, may be tested at any point of their length. It is also possible to compare the magnetic characteristics of specimens that are of various forms. The fact that measurements taken by the permeameter may be used to obtain information concerning the previous heat or mechanical treatment of magnetic materials makes its use of great importance in industrial plants.

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EDITORS:

A. I. FINDLEY WILLIAM W. MACON GEORGE SMART

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The World's Steel Capacity

The world's steel production in 1913 and the estimated capacity at the beginning of the war are shown below. The 1913 production figures, steel ingots and castings, are in gross tons for the United States, United Kingdom and Canada, and in metric tons for the other countries, but the totals as well as the estimated capacities are in gross tons.

	1913 Production	Capacity
United States	31,300,874	35,000,000
Canada	1,042,503	1,100,000
United Kingdom	7,663,876	7,900,000
Germany	18,958,819	18,650,000
Austria-Hungary	2,625,879	2,600,000
France	4,686,866	4,600,000
Belgium	2,466,630	2,450,000
Russia	4,837,000	4,800,000
Italy	933,500	925,000
Sweden	590,887	600,000
Spain	241,995	380,000
Japan	13,510	15,000
Total	74,803,634	79,000,000

The chief difficulty in making an estimate of the world's capacity at the present time is the uncertainty with respect to the situation as to the Belgian and French territory overrun by the Germans. A complete statement as to the physical conditions at the works in question would not settle the matter, as the time element in getting them in condition would still be involved.

The greatest increase in capacity has been in the case of the United States, our capacity in ingots and castings being now about 49,000,000 tons. Canadian capacity is practically unchanged. The British increase in capacity has been generally overrated. London *Iron and Coal Trades Review* attributes the reports to "politicians" and noting that the 1917 output was 9,752,328 tons, indicates that the existing capacity is about 10,500,000 tons. The German capacity cannot possibly have increased, for the actual output underwent a large decrease, the estimate for 1916 being 16,035,000 metric tons. Production of Austria-Hungary in 1916 was 3,330,306 metric tons, an increase over 1913 of 700,000 tons. Russia is, of course, unchanged. Italy has had an increase of more than 300,000 tons, perhaps considerably more. The minor producing countries have had practically no change. Assuming, for want of precise information, that new construction in France balances damage done during the war to French and Belgian works, and taking account of the changes noted above, the world's capacity to-day would seem to stand at 96,620,000 gross tons of steel ingots and castings a year.

Such a capacity would be 22 per cent more than the capacity at the beginning of the war, and 29 per cent more than the actual production in 1913. As one is looking to the future, it may be said that six years have elapsed since 1913. If the world had grown normally during those six years, it would, probably, be inclined to absorb 29 per cent more steel. In 1913 and for years previously, a war cloud was hanging over Europe, while industrial and financial conditions in the United States were by no means wholly satisfactory. Most South American countries were decidedly in straits. In the new world that is coming, stable conditions that will invite the investor are hoped for. This one cannot well appraise at the present time, but it is justifiable to put the matter in this form, that if the hopes are not realized, it will be a grievous disappointment.

As to the United States, and recurring to the three totals that have been cited, the 74,800,000 gross tons of steel ingots and castings produced in 1913, the 79,000,000 tons capacity at the beginning of the war and the 96,600,000 tons capacity at present, the United States proportions are, respectively, 42, 44 and 51 per cent.

This change in the proportion may be variously construed. Some observers seem rashly to have concluded that by whatever tonnage we have increased our capacity during the war we must now increase our exports or suffer with lean order books. It should be perfectly obvious, however, that if the world's requirements in steel are to be greater than they were before the war, there is no large market that has experienced as substantial an improvement in its position as the great American market itself. Moreover, the past six years do not constitute the only period by any means in which the capacity of the United

States has grown more rapidly than that of the rest of the world. If precedent counts, it is the normal thing. Citation of statistics could go on almost without end. Only one set of figures will be presented. The production of steel ingots and castings in 1907 was 23,362,594 tons, and a fair estimate of capacity at the end of 1907 is 25,000,000 tons. For the end of 1913 capacity has been estimated at 35,000,000 tons, and the estimate above for present capacity is 49,000,000 tons. From the end of 1907 to the end of 1913 is six years, and six years more brings one to the end of 1919. There is to be no further important expansion in capacity and the question is whether there will be a capacity demand for a period of several years, so that one is justified in looking forward to the end of 1919, making this second period of six years. Now the arithmetical fact is that from 25,000,000 tons to 35,000,000 tons is precisely 40 per cent, and from 35,000,00 tons to 49,000,000 tons is precisely another 40 per cent.

Americanization and Research

Some public meetings have been held in Waterbury, Conn., as in other progressive cities, to discuss the problems of the reconstruction period. Plain and neighborly conferences they were, intended for a frank exchange of the ideas of all whose thinking on this uppermost question would be of value to the community.

Among the speakers was John H. Goss, general manager of the local plant of the Scovill Mfg. Co. He put special emphasis on two points that ought to be of primary importance in any scheme of preparation for the nation's future. These essentials, in his judgment, were provision for industrial research and for thorough-going Americanization.

Few will disagree with him. Both are national questions, away and beyond any local limits. Research has been stressed by the national societies of engineers. They have had at work almost constantly for several years devoted committees giving unstinted service to the investigation of technical topics. Many of these researches have provided excellent aids to commercial purposes as well as to the technology of the industries. Similar work, though not so extended in scope, is being done by the experts of the Government's Bureau of Standards, though this admirable organization has necessarily limited its efforts to the testing and gaging that in the rapid advance of American engineering have made so many and engrossing demands upon Dr. Stratton and his associates.

That this Bureau will receive the additional recognition and funds for its extension into all branches of the industries is only what may fairly be expected. Another factor to that end, very encouraging as showing the attitude of all engineers, is the increased allowance voted by national societies for similar purposes.

Perhaps we may sometimes see the engineering societies directly or through such a medium as the Engineering Council, together with the technical schools of the country, united with the Bureau of Standards in research work. A general focusing of scientific vision upon many perplexing problems in manufacturing will be a national asset of untold good.

There is no reason why the technical schools, elementary and collegiate, should not concentrate upon the study of these matters. The work done at such an institution as the Municipal School of Manchester, England, by Doctor Nicholson and his students on high speed steels in lathe work, on the efficiency of drills, etc., shows what can be done by an enthusiastic instructor to whom the requirements of commerce are more impressive and impelling than any mere repetition of textbook commonplaces ever was to the old-fashioned groove-worn teacher. Better the following up of these lines of study where every step counts gain for all than an attempt, as is so often made in the name of education, to imitate commercial production without proper regard for the output. Either link up the schools accurately or not at all. If they are in the procession, let us see they are in step.

An easy and logical course leads us naturally from the attitude of the school toward industry and engineering on to its possible contribution to Americanization. As never before do we all realize what it is to be an American. Now is the time to enlist every agency for the spread of our language and all the ideals that follow in its trail. For language is the primary contact of the foreigner with our institutions. Without the language he is sadly handicapped. He is a source of danger to himself and to all others in our industrial plants. Understanding filters to him slowly and full of lapses. Production halts because of his ignorance. Accidents thrive by reason of his deafness to words of instruction. He is not of us unless he knows. Until that time arrives, he cannot be for us and for what is meant by our flag.

Mr. Goss is right. What he said is well worth repetition and reiterated emphasis. Let us have more pressure on Americanization and research.

Brains for the Railroads

Discussion of what is to be done with the railroads has only begun. It will be a very live topic for many months. The President has made certain suggestions to Congress, the Director General has made certain proposals, and the Interstate Commerce Commission in its annual report to Congress has made its contribution. These and other references to the railroad question deal largely with the alternatives presented. The courses from which a choice can be made are outlined, with little discussion of the motives and principles that should govern the making of the choice. The President has referred to three plans and five have been mentioned by the Interstate Commerce Commission.

There need be no elaboration of the proposition that fair treatment of the owners of the railroads and fair treatment of the public are primary considerations. But it should be taken as a first principle in all the discussion that what is wanted on all hands is that the maximum amount of brains possible should be put into American railroading. The more brains, the more

efficiency. The greater the efficiency the greater returns upon railroad investment and the better the service the public receives in proportion to what it pays. All proposals should be considered in the light of how much brains they are likely to put into the actual operations in future years. The argument as to brains has hitherto been used in a one-sided manner. It has been pointed out that Government operation would probably mean interference by politicians, hence a decrease in railroading efficiency. That is true, but it is merely the negative side of the argument. It shows how brains might be taken out, but not how brains can be put in, and it is very dangerous in this, that it fails to take account of the fact that the opposite of Government operation does not insure even the continuance of the amount of brains that has hitherto been exercised in railroad operation and development.

There have been incentives in the past that would be taken away by some of the schemes, short of Government operation, that have been proposed. For instance, many men controlling small lines have worked hard to develop their properties so that trunk lines would buy them as feeders. Other men have worked hard because they controlled one trunk line, competing with another. Some of the plans proposed for the railroads would eliminate those incentives, thus reducing the amount of brains employed in conducting railroading. Again, there is frequent reference to the results achieved during the war under what has appeared to be Government operation. To a large extent men were putting their best brain power into their problems through what is called patriotism, and that could not be counted upon in future.

Thus it seems obvious that whatever scheme is proposed for the railroads, the first question that should be asked is "How much brains will it put into railroading?" If the maximum of brains is put in, the results will be such as to make it very easy indeed to render full justice to the owners of the railroads and to the public. There will be a large bonus besides, of which each party can have a portion.

American Manganese Development

The war ends with the American steel industry well supplied with its manganese-alloy requirements. Four years ago deep concern was expressed as to what could be done to increase the supply existing then or to devise substitutes for manganese. One of the most striking achievements of the war has been the creation of an American manganese-alloy industry. As indicated by an analysis on another page of this issue, the output of ferromanganese has steadily advanced until last month the highest record in the history of the country was reached at 36,300 tons. The 1918 output to Dec. 1 had reached an average of 29,200 tons per month.

The expansion is better appreciated when contrasted with the pre-war record. In 1913 the output was only a little over 9900 tons per month and for five years, 1910 to 1914 inclusive, it only slightly exceeded 8200 tons per month. Then there was practically only one American producer of ferromanganese and one of spiegeleisen. Now there are over twenty producers of one or both.

An interesting factor in this remarkable record is the extent to which domestic ores have been used. For the 321,000 tons of ferromanganese made in the first 11 months of this year not less than 800,000 tons of ore would be necessary if 80 per cent alloy were the product. Importations of ore have exceeded 431,000 tons in the first 10 months and domestic output of high analysis is officially estimated to have been about 300,000 tons in the first 11 months. Recognizing that the alloy produced has been nearer a 70 per cent than an 80 per cent product, it is probable that ore from American mines has contributed about 40 per cent of the domestic product.

It is perhaps too early to forecast the future of this industry. Before the war British 80 per cent alloy was sold at our seaboard at $38 per ton. The market value of the American product today is from $240 to $250 per ton, delivered. Much higher than pre-war prices will be necessary to maintain so valuable an industry in existence. The entire situation deserves the serious attention of economists and of legislators. It must be said that the outcome of some of the war-stimulated enterprises in manganese mining has not been such as to encourage a repetition of this development should future emergencies call for dependence on home sources of supply.

Magnesite Output in California and Washington

WASHINGTON, Dec. 24.—Magnesite production in the United States has shown a decided decrease in 1918, according to figures of the U. S. Geological Survey. In the first nine months of the year California produced 69,500 gross tons and Washington, the only other producing State, had an output of 90,500 tons. The combined output of these two States in the fourth quarter will be about 65,000 tons, making the total for the year about 225,000 tons. This is a large decrease—about 30 per cent—from the output of 1917, when California produced 211,000 tons, and Washington 105,000 tons.

California magnesite was in large demand in the Eastern States in 1917 for use as refractory material, especially in making steel, but a combination of circumstances has greatly lessened the demand in 1918. In the first place crystalline magnesite from Washington, which is accounted superior to California magnesite as a refractory material, was sent to the market in increasingly large quantities in 1917 and its output was maintained in 1918; second, an increase in freight rates and a shortage of cars reduced the demand and hindered deliveries; third, dead-burned dolomite was with fair success substituted for magnesite for making refractory products in the Eastern States.

In the State of Washington only two companies are operating, but they have spent large sums of money during the last two years in developing quarries and building plants and are now able to produce raw and calcined magnesite in large quantities. Each company can now turn out more than 10,000 tons of raw magnesite a month. The Northwest Magnesite Co. is making several thousand tons a month in a large plant which it has erected at Chewelah, 60 miles north of Spokane. The plant includes five rotary kilns, each 120 ft. long, which are fired with pulverized coal. The American Mineral Production Co. ships several thousand tons of raw magnesite a month from Valley to Irvin, 8 miles east of Spokane, where it is burned in the plant of the International Portland Cement Co. Practically all the magnesite produced in Washington goes in the dead-burned form to steel plants and to manufacturers of refractory products east of the Mississippi. O. F. S.

WAR DEMANDS FOR MINERALS

How They Were Met by the Mines—Experimental Work at Universities

WASHINGTON, Dec. 24.—Production of rare "war minerals" in the United States shows an important increase, according to the annual report of the Bureau of Mines, which says:

"In 1913 the United States produced 4000 tons of high-grade manganese ore; in 1917, 110,000 tons, and in 1918 it may produce 250,000 tons. In 1913 the country produced 340,000 tons of pyrite; in 1917, about 450,000 tons; in 1918 it is expected to produce 500,000 to 700,000 tons. In 1913 the production of chromite was 250 tons; in 1917 about 40,000 tons. In 1913 the output of raw magnesite was 10,000 tons; whereas in 1917 it was 315,000 tons. These figures indicate the rapid expansion of the domestic production in response to war demands. But in 1917 imports from overseas amounted to 650,000 tons of manganese ore, 750,000 tons of pyrite and 72,000 tons of chromite. As regards our mineral resources, the possibility of a much larger production is very promising."

Interesting work is being done by the Bureau in cooperation with the University of Minnesota. On this the report says:

"About 88 per cent of the total output (valued at $65,000,000 in 1917) of iron ore in the United States is produced in the Lake Superior district, which comprises the States of Minnesota, Wisconsin and Michigan, the value of iron ore produced in 1917 in the State of Minnesota alone amounting to $45,000,000. Much of this enormous production comes from large bodies of high-grade ore, but there are vast deposits of low-grade ore. As the supply of high-grade ore may be exhausted in 30 years the problem of beneficiating the low-grade ores so that they can be profitably used in the blast furnace becomes of increasing importance. As Minnesota ranks first among the States producing iron ore, its annual output being nearly three times that of the next State, Michigan, and as excellent opportunities for co-operative work were possible with the University of Minnesota, which through its School of Mines experiment station was already making systematic investigation of such low-grade iron ores, the second of the mining experiment stations established in 1917 was located at Minneapolis. The problems to be investigated at this station include the concentration of sandy and of cherty hematites, of lean magnetites and titaniferous magnetites, and the concentration of manganiferous ores. Because the steel industry needed at once a large amount of manganese, and as imports of foreign manganese ores were greatly curtailed by the necessity of utilizing ships for transporting troops and supplies to Europe, the obtaining of enough domestic ore had become a problem of pressing importance. For this reason it was decided that the first year's work of the new station should be entirely on manganese."

This station has already done important work on the manganese question. In co-operation with Cornell University, at the latter's electric furnace laboratory, important experiments have been made in the electric smelting of low-grade domestic manganese ores. The ores thus far tested have been not only lower in manganese than are acceptable to blast furnaces and electric furnaces, but are also higher in silica; some are higher in phosphorus.

By-Product Coke Producers' Association

At a meeting of the by-product coke producers held in New York last week, the By-Product Coke Producers' Association of America was reorganized, and W. H. Ball, Semet-Solvay Co., Syracuse, N. Y., was elected president. The association is now divided into two divisions, the activities of each being guided by a vice-president. One division is known as the Middle Western Division, with James A. Galligan, Pickands, Brown & Co., Chicago, vice-president, the other being the Atlantic Division with Nils Anderson, Debevoise-Anderson Co., New York, vice-president.

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Lifting Restrictions on Commerce

WASHINGTON, Dec. 21.—Vance C. McCormick, chairman of the War Trade Board, told newspaper men at a conference that the Board is pursuing the policy of lifting the ban upon imports and exports as speedily as possible and that practically all commodities will be removed from the conservation list shortly with the exception of certain food products. The Board has issued a new export conservation list which becomes effective immediately, and which is a great modification upon the last one. In addition to the staple foods and food products the list retains the following articles: Steel alloys, aluminum ingots, cartridges and shells, arms, nickel, copper bars, steel sheet bars, block tin, steel blooms, carbines, coal and coke, copper pigs, copper ingots, oils (engine oil), explosives, firearms, sheet bars, iron and steel billets, blooms, ingots, pig iron, ferrosilicon, ingots-aluminum, copper, nickel and steel, plates (all classes, ¼ in. thick and heavier and wider than 6 in. or over 6 in. in diameter), rails, over 50 lb. per yard, scrap, shapes (plain, including angles, channels, beams, tees and zees), slabs, spiegeleisen or mirror iron, jewelry, metallic tin, metallic tin pipe, mica, monazite, nickel and its chemical compounds, terne and tin plate, potash and its compounds, scrap iron, steel and tin, and tin ore, plate and pig.

Director General McAdoo has ordered contracts let for a $1,600,000 fleet for the Warrior River, Alabama, as follows: Four steel self-propellers, three tow-boats and 23 wooden barges. The self-propellers for the Birmingham and New Orleans trade via Mobile will have a coal carrying capacity of 1500 tons and a capacity of 500 tons of general merchandise. The fleet, it is announced, will be ready by July. Birmingham is now arranging to place terminals on the river bank 20 miles from the city at a railroad crossing.

WESTINGHOUSE MARINE WORKS

Expansion Planned to Four Times Its Present Capacity

The Westinghouse Electric & Mfg. Co. has answered the question regarding its peace policy by immediately beginning the expansion of its works at Essington, Pa., to four times the present capacity. Not only will the present operating force of 3500 mechanics and laborers be retained, but it is planned to increase the number to 5000 at once and later to 12,000. Contracts are now held for 250 ships for the Emergency Fleet Corporation, to be equipped with the Westinghouse marine system of propulsion machinery, besides other contracts with the United States Government for destroyers, cruisers, and other naval units. Whether the present policy of a bigger navy stands or not, the enormous demand for merchant ships which have been depleted by the U-boat warfare will now force the completion of the plans of the company originally intended at South Philadelphia.

Contracts with the Government for marine equipment are expected to stand, and the broad policy of this country for developing a great merchant marine is beginning to assume definite proportions, so that business is practically assured for the Essington plant for some time to come; but even though these prospects do not materialize, the Westinghouse company needs the new developments for the expansion of its general electrical business. The parent works at East Pittsburgh, Pa., have completely covered all of the available space, and Essington will have to take over some departments of the industry.

The company is now carrying out its specifications for a town site for its employees. The program calls for 1400 cottages, of which 100 will be finished by Jan. 1 and 200 are in process of construction. The nature of the work in the plant requires a high order of mechanics, and since the beginning of operations last summer these men have come from all sections of the country. It is the purpose of the company to make living conditions so reasonable and attractive that the men will be contented to stay. A club hotel for men is already complete accommodating 500, and the building up of the new town of Essington will provide an ideal Westinghouse community.

In the plant itself the greatest attention is given to the comforts of the operatives, provisions being made for the best hygienic conditions, modern sanitation, lighting and ventilation. Sanitary drinking fountains are everywhere. A mezzanine floor in the foundry is provided with individual clothes lockers, washrooms and shower baths. The welfare work includes a complete relief department, with a hospital and medical attendance, a large dining room, two cafeterias and provision for social entertainments and amusement.

The property of 500 acres for the Essington plant was purchased in 1916, ground was broken in April, 1917, and actual production was begun last June. Of this land, 110 acres were set aside for manufacturing purposes, but the abnormal conditions of the time made it impossible to develop the site to its full capacity. Seven buildings have been erected and in use, covering a floor space of 35 acres, at a cost of $20,000,000. They comprise a pattern storage building, foundry, forge shop, machine shops (1 and 2), power house and erecting shop. The site includes a mile of river front development on the Delaware. Plans are laid for an immense construction of inlet piers where vessels can be equipped virtually at the doors of the plant, thus saving transportation charges and economizing on assembling costs. Tracks of the Pennsylvania and Philadelphia & Reading railroads traverse the entire north and south lengths of the grounds, and main line switch tracks run directly into the factory. In all, there are 41 miles of track in the yards, used for both steam and electric locomotives.

The Essington works has been turning out marine power propulsion machinery for one ship a day and has broken all records during the critical days of the war.

Heavy Demand for Stampings Is Expected Next Year

At the December meeting of the Pressed Metal Association, Traymore Hotel, Atlantic City, N. J., replies indicated that the members of the association employ about 20,000 people, of whom about 3 per cent are women. Had the Government adopted a policy of immediate cancellation of direct contracts and related subcontracts, 40 per cent of these employees would have been subject to immediate release, according to the statistics reported. Careful investigation indicates that the demand for stampings during 1919 will be from 25 to 40 per cent greater than during the pre-war period. Members who required a total of 70,000 tons of steel for their 1918 production estimated that they would need 90,000 tons during 1919, or, in other words, that their requirements for the coming year would be approximately 125 per cent of previous requirements.

Labor conditions were discussed at length. The subject of encouraging the organization of shop committees to consult with employers on labor difficulties was explained and it seemed to be the consensus of opinion that such an organization was very helpful. The labor policies of several companies, and particularly those of the Irving Pitt Co., Kansas City, and the Hydraulic Pressed Steel Co., Cleveland, were described. The subject of group insurance was taken up briefly with the resulting opinion that the movement was not particularly successful from the point of view of the employer or the employee.

Douglas P. Cock, Boston Pressed Metal Co., Worcester, Mass., was elected president, and W. W. Galbreath, Youngstown Pressed Steel Co., Youngstown, Ohio, vice-president.

May Build Large Automobile Plant

DETROIT, Dec. 24.—Upon the action which the common council may take, on the petition filed in the name of the General Motors Corporation by W. C. Durant for the closing of a part of Dequindre Street, will probably depend whether the Cadillac Motor Car Co. will build a new plant upon the property through which that length of Dequindre Street runs. All told, the property comprises 20,000 acres. Plans are said to have been drawn up for the erection of an immense modern automobile factory, but these plans can not be put through, it is declared, unless that part of Dequindre Street bisecting the tract is closed.

In automobile circles it has been known for some time that the General Motors Corporation intended to put up a new modern factory for its subsidiary, the Cadillac company. In fact, at the time the Lelands were still the heads of the local plant it was said that plans had been prepared for the establishment. However, the war caused these plans to be abandoned for the time being. The present facilities of the Cadillac plant are far from adequate, and, furthermore, the plant consists of a number of scattered units, instead of a single unit as is now planned.

Electric Furnace Co. to Broaden Its Products

The Electric Furnace Co., Alliance, Ohio, is planning to add several new types of electric furnaces to its present line of products, now that its plant capacity is no longer required for war work. The new equipment to be brought out will include automatic turn pit furnaces, electric soaking pits, furnaces for the heat treatment of large material such as rails, etc., building of equipment for the production of fertilizers and the calcining of limestone, and the building of furnaces for the melting of copper. The company states that, while it has added extensively to its plant, its new equipment will be required for peace-time work, particularly for the making of heat-treating furnaces for automatic work. Its war work consisted of brass and copper melting furnaces for rolling mills and foundries, doing aircraft and ordnance work, and making heat-treating equipment for airplane motors and for heating shell forgings. It is expected that an extension to the plant will be required the latter part of the coming year.

LABOR IN ENGLAND

Memorable Discussion in London at Luncheon to American Guests

LONDON, ENGLAND, Nov. 29.—The effort Great Britain is making to forestall the outbreak of widespread labor troubles, perhaps in themselves exaggerated, was the theme of a memorable meeting to-day at Printing House Square, London. Lord Northcliffe gave a luncheon to the representatives of the business press of the United States, now spending a few weeks in England and France as the guests of the British Government, and he had invited a large representative gathering of Britain's captains of industry. The addresses were extempore and by that fact emphasized the sincerity of the hope for co-operation between our two countries in foreign trade as there has been in waging war. Two of the notable addresses were made by W. L. Hichens, chairman Cammell Laird & Co., steel makers and shipbuilders, and by Sir Robert Hadfield, member of the Munitions Inventions Board for the Army and of the Marine Engineering Committee of the Navy, and chairman Hadfields, Ltd., Sheffield. Among those present were Lord Inchcape, chairman British India Navigation Co., and director Suez Canal; Lord Desborough, president London Chamber of Commerce; Sir John Ellerman, a leading ship owner; Sir Vincent Caillard, director Vickers, Ltd.; Robert P. Skinner, American Consul-General; E. Manville, chairman Birmingham Small Arms Co., Ltd., and chairman Daimler Co., Ltd., and G. Holt Thomas, chairman Aircraft Mfg. Co.

Mr. Hichens' Address

What Mr. Hichens had to say was in part as follows:

"We want to maintain wages, or, if possible, to increase them. We should like to reduce working hours, to deal with the problem of unemployment. According to statisticians, the income of this country before the war was £7,000,000 a day, or about 3s. per head for every man, woman and child. Three shillings a day is a very small sum on which to work out the ideal state we want to see. We all realize that that can be secured only by increasing production."

"Production can only be increased in two ways. One is by improving mechanical devices. We want power stations, mechanical improvements in our railways, great improvement in all our factories. That will cost us a great deal. Even more important is to increase the output from the worker himself. In the past one of the greatest troubles of this country has been the restriction of output. We have to get the worker to realize that it is not merely in his own interests, but in that of the community as a whole, that he should produce as much as he can without any kind of restriction.

"Those two things can only be secured in one way. That is, if we can assure both sides—namely, the capitalists and the workers—that the increased wealth is going to be fairly distributed between the two. That is fundamental.

"It is not right that the capitalist should have the last word as to the amount of profit he is to make in any enterprise. The principle on which industry is based to-day is sound, and should be continued, namely, that each industry caters for the consumer, in other words, for the community as a whole. Industry ought to be at the service of the community as a whole. It is not right that any section should claim to determine how much of the profit it is going to have for itself. That is really the claim that the capitalist has put forward. The capitalist has to submit to the principle that the state should determine what is a fair and reasonable return. In other words, I believe the principle of the excess profits tax is right. I know it is not in all respects popular.

"On the other hand, labor is no more entitled than capital to hold the community up to ransom, and to pillage them by means of strong combinations. Labor is entitled to put forward its case as strongly as it may, but, having done that, must recognize that it ought to do what its strength entitles it to do. That is the principle that might is right, which we have been fighting against in the war. Are we going to support the application of that principle in our own countries? I contend that it is for every civilized nation and every individual in a civilized nation to fight the principle that might is right in their own countries as they have fought it elsewhere."

The Shipping Outlook

Sir John Ellerman said that we were faced in this country with a new phase of competition that had never occurred to any serious extent before, and that was that in the future America and other nations would take a very prominent position in the shipping industries of the world. We should only secure what he might call common effort to advance the welfare of the world if on the one hand we were prepared to pay reasonable rates of wages to our men, and on the other hand we co-operated with those states and with those countries where hitherto we had carried on trade almost exclusively. It was to future co-operation with America that he looked to see the joint flags ruling in most countries in the world where formerly the English and German flag alone were seen.

The 48-Hour Week

Sir Robert Hadfield said: "I have tried to be somewhat of a pioneer in regard to the question of labor. Some 25 years ago I took the opportunity of trying the experiment of giving a 48-hr. week to my workmen. I must confess that I got some of my ideas from my visits to America. I found that in some cases there the workers did not start until they had had breakfast. I was sure it was only a rational way to expect a workman to start his work. He could not be expected to go to work before he had had something to eat, and in America, although they have a longer working day than we have, they followed out that principle. My own firm 25 years ago introduced the 48-hr. week. We were told that we should land in disaster. It has been anything but that. There has been a very great advantage in a shorter working day, and in this country only a few days ago a 48-hr. week was adopted by the employers of the northeast coast of England.

"It seems to me we have the greatest opportunity that has presented itself in the history of the world. We have England and America working side by side. Why should we not extend that principle? Why should not wages in England be as good as the wages in America and the hours of working just the same in the two countries? The men are very much the same. We have the finest opportunity of exchanging ideas by the wonderful way we have been brought together in this war. We are together now. Do let us remain together, and work side by side, not merely from the selfish point of view of earning money and paying dividends, but of trying to raise the condition of humanity. A secretary or a clerk is given a 10 days' holiday and paid his wages, but when the worker puts down his tools he gets no remuneration. I do not see why the time has not come when the worker also should be able to have a week or 10 days' holiday and be paid for it. I believe ways could be found of carrying out such a proposal."

W. W. M.

The Wickwire Steel Co. is opening a New York office in the Equitable Building, 120 Broadway, New York. This office is to be in charge of Allan Fraser, Eastern sales manager of the company, who will start in the new office Jan. 1. Mr. Fraser was formerly district sales manager at the Buffalo office of the American Steel & Wire Co.

The McCoy Iron Works, Inc., structural steel fabricator, Perth Amboy, N. J., will shortly transfer its operations to a new plant which it has erected at Utica, N. Y. Occupancy would have been taken some time ago but for the war. It is understood that the company is planning to lease its Perth Amboy works.

Iron and Steel Markets

STRIKING CONTRASTS

Conditions Differ Widely from Those at Close of Last Year

Pig Iron Sellers Generally Accept New Schedule —Plans of New Export Company

At the close of the year 1918, never to be forgotten because it marked the attainment of the iron trade's greatest contribution to the winning of the war, conditions contrast sharply with those which prevailed at the end of 1917. Then the operations of manufacturing plants, particularly blast furnaces, were seriously hampered by the inadequate supply of materials, due largely to the extremely cold weather, but the mild weather this winter and the liberal supply of cars have made conditions much more satisfactory. Then the Government price fixing policy had become established and shortly before Christmas the War Industries Board had recommended to the President the extension of the prices promulgated late in the preceding September, thus relieving the fear that the schedule would be reduced. Now the trade witnesses the voluntary lowering of prices of pig iron and finished material by most of the manufacturers. Then there was a decided scarcity of labor while now the problem of how the returning soldiers and the employees discharged from war industries will find jobs is causing no little anxiety at Washington and in industrial centers. Then the percentage of output being made for the Government was rapidly increasing while now it is even more rapidly declining. Then all thoughts were concentrated on how to render the most efficient service to the cause of the United States and its Allies while now all efforts are directed toward an orderly readjustment of industries.

In organizing for the post-war extension of commerce independent steel manufacturers have named the new export company the North American Steel Products Corporation and selected as president E. A. S. Clarke, long prominent as a manufacturer of steel and during the war a very active worker in cooperating with the Government in the regulation of prices without legislation. Exporters who are not manufacturers have expressed anxiety as to whether their sources of supply would be cut off by the new organization, but it is authoritatively stated that the corporation will be so conducted as to give no ground for complaint on the part of exporting houses, which will be able to obtain steel from it or from other companies. The corporation will have a definite percentage of the product of its companies set aside for it.

The new form of contract which has been agreed upon by the Contract Committee of the American Iron and Steel Institute, except as to a few details, is expected to have an important influence on standardizing contracts and stabilizing conditions. It is intended to prevent both overselling and overbuying, to bind both buyer and seller, and to be strong enough to resist all attempts at cancellation. The new attempt to make contracts more than options will probably be inaugurated at an early date and may be subjected to severe tests during the readjustment period.

Sellers continue to call attention to high costs and low stocks and it certainly is true that the stocks of pig iron in furnace yards are very low, but there is an increasing tendency on the part of pig iron sellers to accept the new schedule which reduces prices $3 per ton on sales for delivery after Jan. 1. A few furnaces still insist that they will not reduce prices, but it is probable that at an early date the quoting at the lower level will prevail as to a very large percentage of the tonnage still to be sold for the first half of 1919. Statistics show, however, that many furnaces are sold up to July 1 as to 90 per cent of their estimated production.

In finished materials, there is very little buying at the new schedule. This causes no disappointment, for it was not expected, during the holiday season with so much uncertainty existing for various reasons as to the future, that buying would be active. There is a fairly good demand for tubular goods with almost none for structural shapes.

Implement manufacturers are displeased on account of the announcement of the new price schedule. When they received a concession of $5 per ton on bars about the middle of the year, they entered hard and fast contracts to which they must adhere. Now they say their customers, having heard of a new reduction, are endeavoring to cancel contracts for implements, despite the fact that most of the steel has been delivered.

Pittsburgh

PITTSBURGH, Dec. 23—(*By Wire*).

There is a wide range in the volume of business being done in different branches of the finished steel trade. Sheets and tinplates, so often regarded as cognate products, are widely separated, there being an excellent demand for sheets while there is scarcely any demand for tin plate. Demand for tubular goods is moderately active and in the case of jobbing demand is fairly active. Among the heavy rolled products, plates make the best showing, bars being in lighter demand, while there is scarcely any call at all for structural shapes. Shipments of wire products have been heavy in the past few weeks and have already gone far toward replenishing stocks that were so greatly reduced by war-time restrictions upon distribution. The demand for steel products in the aggregate is light and it certainly has not been improved by the price reductions that went into effect about 10 days ago. It is the normal experience in the steel trade for business to be very light after reductions have been

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Dec. 24, 1918	Dec. 17, 1918	Nov. 26, 1918	Dec. 24, 1917
No. 2 X, Philadelphia	$39.15	$39.15	$39.15	$34.25
No. 2, Valley furnace	34.00	34.00	34.00	33.00
No. 2 Southern, Cin'ti	37.60	37.60	37.60	35.90
No. 2, Birmingham, Ala.	34.00	34.00	34.00	33.00
No. 2, furnace, Chicago*	34.00	34.00	34.00	33.00
Basic, del'd, eastern Pa.	36.90	36.90	36.90	33.75
Basic, Valley furnace	33.00	33.00	33.00	33.00
Bessemer, Pittsburgh	36.60	36.60	36.60	37.25
Malleable Bess., Chicago*	34.50	34.50	34.50	33.50
Malleable Valley	34.50	34.50	34.50	33.50
Gray forge, Pittsburgh	34.40	34.40	34.40	32.75
L. S. charcoal, Chicago	38.85	38.85	38.85	37.50
Billets, etc., Per Gross Ton:				
Bess. rails, heavy, at mill	$55.00	$55.00	$55.00	.....
O-h. rails, heavy, at mill	57.00	57.00	57.00	.....
Bess. billets, Pittsburgh	43.50	43.50	47.50	$47.50
O-h. billets, Pittsburgh	43.50	43.50	47.50	47.50
O-h. sheet bars, P'gh	47.00	47.00	51.00	51.00
Forging billets, base, P'gh.	60.00	60.00	60.00	60.00
O-h. billets, Phila.	47.50	47.50	51.50	47.50
Wire rods, Pittsburgh	57.00	57.00	57.00	57.00
Finished Iron and Steel, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	3.745	3.745	3.745	3.685
Iron bars, Pittsburgh	3.50	3.50	3.50	3.50
Iron bars, Chicago	3.50	3.50	3.50	3.50
Steel bars, Pittsburgh	2.70	2.70	2.90	2.90
Steel bars, New York	2.97	2.97	3.17	3.095
Tank plates, Pittsburgh	3.00	3.00	3.25	3.25
Tank plates, New York	3.27	3.27	3.52	3.445
Beams, etc., Pittsburgh	2.80	2.80	3.00	3.00
Beams, etc., New York	3.07	3.07	3.27	3.195
Skelp, grooved steel, P'gh.	2.70	2.70	2.90	2.90
Skelp, sheared steel, P'gh.	3.00	3.00	3.25	3.25
Steel hoops, Pittsburgh	3.30	3.30	3.50	3.50

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire, Per Lb. to Large Buyers:	Dec. 24, 1918 Cents	Dec. 17, 1918 Cents	Nov. 26, 1918 Cents	Dec. 24, 1917 Cents
Sheets, black, No. 28, P'gh.	4.70	4.70	5.00	5.00
Sheets, galv., No. 28, P'gh.	6.05	6.05	6.25	6.25
Wire nails, Pittsburgh	3.50	3.50	3.50	3.50
Cut nails, Pittsburgh	5.00	5.00	5.00	4.00
Fence wire, base, P'gh.	3.25	3.25	3.25	3.25
Barb wire, galv., P'gh.	4.35	4.35	4.35	4.35
Old Material, Per Gross Ton:				
Carwheels, Chicago	$27.00	$27.00	$29.00	$33.00
Carwheels, Philadelphia	25.00	29.00	29.00	30.00
Heavy steel scrap, P'gh.	25.00	25.00	28.50	30.00
Heavy steel scrap, Phila.	20.00	25.00	27.00	29.00
Heavy steel scrap, Ch'go.	23.00	23.00	27.00	28.50
No. 1 cast, Pittsburgh	27.00	27.00	29.00	30.00
No. 1 cast, Philadelphia	28.00	29.00	29.00	30.00
No. 1 cast, Ch'go (net ton)	26.00	26.00	27.00	25.50
No. 1 RR. wrot, Phila.	32.00	32.00	34.00	35.00
No. 1 RR. wrot, Ch'go (net)	25.00	25.00	28.00	31.25
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$6.00	$6.00	$6.00	$6.00
Furnace coke, future	6.00	6.00	6.00	6.00
Foundry coke, prompt	7.00	7.00	7.00	7.00
Foundry coke, future	7.00	7.00	7.00	7.00
Metals, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	26.00	26.00	26.00	23.50
Electrolytic copper, N. Y.	26.00	26.00	26.00	23.50
Spelter, St. Louis	8.05	8.15	8.30	7.75
Spelter, New York	8.50	8.50	8.65	8.00
Lead, St. Louis	6.15	6.40	7.75	6.35
Lead, New York	6.50	6.75	8.05	6.50
Tin, New York	72.00	72.00	71.00	85.50
Antimony (Asiatic), N. Y.	8.00	8.00	8.50	15.00
Tin plate, 100-lb. box, P'gh.	$7.35	$7.35	$7.75	$7.75

made, and it is an invariable rule that business is dull during the second half of December and the fore part of January, when buyers are busy with inventories and other year-end matters. Many mills are closed this week, taking advantage of the decreased pressure for their product to make much needed repairs. Very nearly all the tinplate mills are closed as well as many of the pipe mills. In the mills making the heavy rolled products, a number of departments are closed, but there is no general stoppage in the production of ingots. Blast furnaces attached to steel departments that are idle are running with reduced blast pressure so as to keep down the production of pig iron.

Much of the demand that is falling to the mills at this time represents the accumulated scarcity produced by war time restrictions in the distribution of steel, and when this is fairly well satisfied mill operations promise to be lighter until there is a general resumption of buying due to the inception of new projects of an investment character. By the end of January the steel industry may be operating at only between 60 and 70 per cent of capacity. Producers do not regard such a condition as an unmixed evil, as it will give them an opportunity to dispense with the services of men who have not been disposed to render full service. All mills are making a special effort to round out their organizations by keeping the men who are most assiduous in the performance of their duties. No general wage reduction is considered at all probable, but wage costs per ton are likely to be reduced somewhat by more efficient service being rendered. Steel producers are indisposed to make predictions this early as to when demand for steel will broaden out through development and new construction work being undertaken, as this depends chiefly upon how rapidly labor conditions change toward a normal basis.

The common view is that the high cost of construction of works involving the use of steel is a greater bar to the making of investments than the cost of the steel itself. There has been considerable discussion in the steel trade of the new form of sales contract soon to be recommended by the Contract Committee of the American Iron and Steel Institute, this contract providing for the payment of liquidating damages by the seller to the buyer or by the buyer to the seller in case of failure to carry out the contract. The object is to make firm contracts out of such business as has hitherto been largely of an option character. Some of the mills are in favor of general adoption of the new contract but rather look to such concerns as the Carnegie Steel Co. to take the lead, and thus far that company has evinced no intention of adopting the new contract form.

Pig Iron.—At a largely attended meeting of merchant furnacemen in the Pittsburgh, Valley and Lake front districts Wednesday of last week the information was developed that the furnaces are sold up to July 1 as to about 90 per cent of their prospective production, even after they have counted out the few cancellations to which they have agreed. It was also developed that consumers who need iron are already so well covered by contracts that there is practically no fresh inquiry in the market. One small sale of basic was reported at $33. In these circumstances, it seems very improbable that the furnaces will reduce prices from the level held under Government control either on Jan. 1 or in the near future. The market remains quotable at Government limits as formerly.

Basic pig iron, $33; Bessemer, $35.20; gray forge, $33; No. 2 foundry, $34; No. 3 foundry, $33.50, and malleable $34.50, all per gross ton at Valley furnace, the freight rate for delivery in the Cleveland and Pittsburgh district being $1.40 per ton.

Skelp.—There has been no fresh activity in skelp. Effective Jan. 1 invoice prices on skelp shipments will probably be adjusted to the reduced level in keeping with the decline in the open market and the lower prices on pipe. We quote sheared skelp at 3c., universal skelp at 2.90c. and grooved skelp at 2.70c. f.o.b. Pittsburgh or Youngstown mill.

Ferroalloys.—The market in ferroalloys is practically stagnant. Recently ferromanganese for resale was offered down at $240 delivered without finding a ready market, and that seems to be as high as the market can possibly be quoted to-day. Recently furnaces reduced their quotations on spiegeleisen $5 per ton to $70 f.o.b. furnace, and this remains the asking price.

We quote 70 per cent ferromanganese at $240, delivered, and 16 to 18 per cent spiegeleisen, $70, f.o.b. furnace, an addition or deduction of $3.50 per unit being made, when the manganese content is above or below the standard. For delivery over the remainder of the year, and for next year, 50 per cent ferrosilicon is quoted at $135 to $140.

We quote 9 per cent Bessemer ferrosilicon at $55; 10 per cent, $57; 11 per cent, $60.30; 12 per cent, $63.60. We quote 6 per cent silvery iron, $42; 7 per cent, $43; 8 per cent, $45.50; 9 per cent, $47.50; 10 per cent, $50. Three dollars per gross ton advance for each 1 per cent silicon for 11 per cent and over. All the above prices are f.o.b. maker's furnace, Jackson or New Strattsville, Ohio, these furnaces having a uniform freight rate of $2.90 per gross ton, for delivery in the Pittsburgh district.

Billets and Sheet Bars.—Despite the much easier position in the steel trade generally, sheet bars are not overly plentiful and some large consumers are not receiving as large supplies as they could comfortably use. Billets are more plentiful and there are numerous small lots of discard steel available, though asking prices are rather stiff.

We quote 4 x 4 in. soft Bessemer and open-hearth billets at $43.50, sheet bars $47, slabs $46, and forging billets $60 base, all f.o.b. at mill, Pittsburgh or Youngstown.

Plates.—No new business of consequence is being placed in the domestic market for plates, but there is fairly active export demand and export prices are ruling much higher than the reduced prices now effective in the domestic market. Some contracts for plates are likely to carry price adjustments on invoices after Jan. 1 in accordance with the reduction just made in open quotations, but contracts for plates for specific jobs are, according to the contention of the mills, not subject to adjustment. In some quarters there are predictions that the plate market will shortly advance. New demand is very light.

We quote sheared plates at 3c., Pittsburgh mill, for delivery after Jan. 1.

Iron and Steel Bars.—Demand for steel bars is light on existing contracts while there is scarcely any new demand. Mills are running at an average of perhaps 60 per cent of capacity. Reports are that the bar iron mills in the Chicago districts have decided to make a reduction of $12 per ton from the 3.50c. Government price hitherto in effect, but it is a question whether Pittsburgh district mills will take similar action.

We quote soft steel bars rolled from billets at 2.70c.; from old steel rails, 2.80c.; common iron bars, 3.50c.; bar iron rolled from selected scrap, 4.25c.; and refined iron bars at 5c. at mill, Pittsburgh. The prices on steel bars apply only on deliveries after January 1, by which time the schedule on bar iron may also be changed.

Sheets.—The sheet mills easily constitute the busiest branch of the finished steel industry as they are operating this week at an average of about 80 per cent of capacity, and with business already assured some of the mills have made up tentative schedules calling for their operating at fully 85 per cent during the whole month of January. During the last few months of the war, the sheet mills were operating at not much above 50 per cent of capacity, and even that was largely on war orders. An acute shortage of sheets appears to have developed and both jobbers and manufacturing consumers are eager for deliveries.

We quote: For delivery after Jan. 1, 3.90c. for No. 10 blue annealed, 4.70c. for No. 28 black and 6.05c. for No. 28 galvanized, all f.o.b. Pittsburgh or Youngstown mill.

Spikes.—No business of importance is being done in spikes and some buyers are asking that adjustments be made under their contracts to conform to the reduction of $4 per ton that has just been made in keeping with the similar reduction in steel bars.

Standard sizes of railroad spikes 9/16 x 4½ in. and larger, $3.70 per 100 lb. in lots of 200 kegs of 200 lb. each, or in larger lots. Boat spikes, $5.05 per 100 lb.; rack bolts, $4.70 base in lots of 200 kegs or more; less than 200 keg lots, $1 per 100 lb. extra. All f.o.b. Pittsburgh.

Tin and Terne Plate.—Nearly all the tinplate mills are closed this week and are engaged in making repairs. There will be a fairly general resumption of the plants next week, but most of them will not operate in full. Demand is always light at this time of year and the mills are indisposed to make up stocks when costs are so high. There is a moderate volume of export inquiry. Thus far the mills are disposed to quote the old Government price of $7.75 on export business, but as the British export price figures are about $7.20, it is a question how much business can be booked except when the American mills have a freight advantage.

Hot-Rolled Strip Steel.—There is no interest manifested in the market. It is expected that a base price of 3.30c. will obtain in conformity with the reduction in merchant bars.

We quote hot-rolled strip steel at $3.50 per 100 lb., Pittsburgh, for third quarter, 50c. per 100 lb. additional being charged for special stamping quality.

Cold-Rolled Strip Steel.—The market continues quiet as to new buying, but shipments are fairly heavy on contracts.

We quote cold-rolled strip steel at $6.25 base per 100 lb. f.o.b. Pittsburgh, for 1½-in. and wider, 0.100 in. and thicker, hard temper in coils under 0.20 carbon. Boxing charge 25c. per 100 lb.

Shafting and Screw Stock.—Buyers are not showing much interest in the market and regard the reduction just made as rather a moderate one.

For delivery after Jan. 1, we quote cold-rolled shafting at 21 per cent off list in carloads and 16 per cent in less than carloads, f.o.b. Pittsburgh.

Wire Rods.—The market is very quiet and buyers are not altogether pleased that no reduction was made in rods when so many other steel products were reduced. They are given the opportunity, however, to avoid reducing prices on their finished products and may find the situation work out fairly well. Prices are given on page 1611.

Wire Products.—Shipments of wire products have been quite heavy in the past few weeks and distributors have better stocks than for some time past but stocks are still regarded as of moderate proportions. There is little disposition to specify further tonnages until after inventory time. Prices are given on page 1611.

Bolts, Nuts and Rivets.—The nut and bolt makers announce that they are not in position to reduce selling prices of their goods by reason of the fact that they will realize so much less on the scrap they produce, which is a fairly heavy percentage of the quantity of steel they use. In the case of rivets, the fact that rods have not been reduced is regarded as a controlling factor. Prices are given on page 1611.

Hoops and Bands.—There has been a fair volume of shipments of hoops and bands under contracts, but specifications are light just now and there is practically no new buying. With the reduction made week before last, hoops and bands are quotable at 3.30c. base.

Wrought Pipe.—By Jan. 1 all the iron and steel pipe mills will probably have put out new lists increasing discounts by three points, this being equal to a reduction of $6 per net ton. Many of the pipe mills are closed this week, but will resume next week. Prospects are good for the reinstatement of line pipe orders whose filling has been held back by the war and the scarcity of labor for laying pipe. Pipe discounts are given on page 1611.

Boiler Tubes.—New prices on welded steel boiler tubes and seamless tubing have not yet been issued, but will probably be announced before Jan. 1. The market is quiet. Current discounts on boiler tubes are given on page 1611.

Coke.—Connellsville coke has continued very scarce and while few, if any, furnaces have been forced to bank, some have been on the ragged edge and many furnaces have had to operate at slightly reduced rates. Production conditions are good at the beginning of this week, but the holiday is likely to make serious inroads on output. Prospects recently have appeared to be that the Fuel Administration would relinquish its control of coke prices at the end of this month, but it is now understood that the control will be continued at least un-

til Feb. 1. In some quarters, it is thought the proposal to disband at the end of this month was put out as a test of the feeling of the trade. If so, the response of the blast furnaces left no room for question as they have been entering vigorous protests against the control being taken off at a time when prices were likely to advance if the market was left to itself. After the winter, the prospects are that coke prices will decline of their own accord. The Connellsville *Courier* reports coke production in the Connellsville and Lower Connellsville region in the week ended Dec. 14 at 283,965 tons, an increase of 11,215 tons, and raw coal shipments at 213,900 tons, an increase of 19,809 tons.

We quote 48 hr. beehive blast furnace coke at $6; 72 hr. beehive foundry coke at $7 and crushed coke over ¾ in. at $7.30, all in tons of 2000 lb. at oven. We quote by-product coke at $5.70 for run of ovens and $6.70 for selected foundry in all States but Alabama and Washington. To these base prices should be added the freight rate from the competing beehive coke district which takes the lowest freight rates to the point where such by-product coke is produced, except that there shall be added for coke manufactured in New England 7c. for each 5c. above 60c. in the freight charges per ton (2240 lb.) of coal for water transportation on the coal used in the manufacture of such coke.

Old Material.—Market prices for scrap continue practically nominal as consumers show no interest and will not even make bids. Trading has been only between dealers and has not involved much of a tonnage. Most contracts expire with this month and buyers will cancel whenever the conditions give them an opportunity. Several of the mills have good-sized stocks of heavy melting steel which they purchased largely as the so-called unguaranteed low phosphorus scrap late in the summer. Quotations given below are largely nominal:

Heavy steel melting, Steubenville, Follansbee, Brackenridge, Monessen, Midland and Pittsburgh, delivered	$25.00 to $26.00
No. 1 cast, for steel plants (nominal)	27.00 to 28.00
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., Franklin, Pa., and Pittsburgh (nominal)	32.00
Compressed steel	24.00 to 25.00
Bundled sheet, sides and ends, f.o.b. consumers' mills, Pittsburgh district (nominal)	22.00 to 23.00
Bundled sheet stamping (nominal)	21.00 to 22.00
No. 1 busheling (nominal)	26.00 to 27.00
Railroad grate bars (nominal)	25.00
Low phosphorus melting stock (guaranteed)	29.00
Low phosphorus melting stock (bloom and billet ends, heavy plates)	32.00
Iron car axles (nominal)	35.00
Locomotive axles, steel (nominal)	35.00
Steel car axles (nominal)	35.00
Railroad malleable (nominal)	31.00 to 32.00
Machine shop turnings	17.50 to 18.00
Cast iron wheels	28.00 to 28.50
Rolled steel wheels (nominal)	33.00
Sheet bar crop ends (at origin) (nominal)	35.00
Heavy steel axle turnings (nominal)	19.00
Heavy breakable cast	26.00 to 27.00
Cast iron borings	17.50 to 18.00
No. 1 railroad wrought	30.00 to 32.00

Cincinnati

CINCINNATI, Dec. 24—(*By Wire*).

Pig **Iron.**—Some Southern makers supplying this territory were first to adopt the proposed price of $31 Birmingham for first half iron, but only two makers there have definitely announced that they are willing to accept business at this figure, and both of these are so well sold up that they will not have very much iron to offer when the inquiry does come out. Right now no one is asking for iron and seemingly melters are not very much interested in the future. Southern Ohio furnaces are so well fixed that they have not yet given any indication as to what date they will enter the market in search of business in competition with other districts where the new schedule has been tacitly adopted. Some Valley furnaces appear to have taken the lead in adjusting their future quotations, and it is now reported that Virginia makers are also willing to make the change on any business offered. Cancellation requests are still reported, but a great deal of caution is exercised in accepting any of these, and it is only in extreme cases where the furnace is at fault in not delivering the metal on contract time that these requests are given favorable consideration. Considerable iron ordered in the second quarter at $33 for shipment in the last half is now going forward. That shipped in the fourth quarter is, of course, invoiced at $34, but undelivered balances that will move in the first quarter of 1919 represent a problem for the invoicing departments that is yet unsolved. In cases where contracts stipulate the last Government price is to rule, this question will not arise, but in other contracts the question involved is a very interesting one.

Based on freight rates of $3.60 from Birmingham and $1.80 from Ironton, we quote, f.o.b. Cincinnati:

Southern coke, No. 1 foundry and 1 soft	$38.85
Southern coke, No. 2 foundry and 2 soft	37.60
Southern coke, No. 3 foundry	37.10
Southern No. 4 foundry	36.85
Southern gray forge	36.60
Ohio silvery, 8 per cent silicon	49.30
Southern Ohio coke, No. 1	37.05
Southern Ohio coke, No. 2	35.80
Southern Ohio coke, No. 3	35.30
Southern Ohio malleable Bessemer	36.30
Basic, Northern	34.80
Standard Southern carwheel	54.60

Finished Material.—The new schedule of prices for shipment after Jan. 1 has been adopted by the mills, but no change whatever has been made by the jobbers, who state that they will not consider any reduction until after the end of the year. The mill price of No. 28 galvanized sheets, on new business alone, and for shipment after Jan. 1, is 6.05c., Pittsburgh basis, and on No. 28 black, 4.70c. As far as can be ascertained, only a limited amount of business has been transacted at these prices. As this is inventory season for many firms, business is very much curtailed. However, jobbers of wire nails report an active demand for small lots from outside retail merchants. In spite of the slowing down of activities in many shops, high-speed steel salesmen report the receipt of a few very attractive orders, which were taken on a basis of $2 per lb.

The following are local jobbers' prices: Steel bars and small structural shapes, 4.13c. base; large rounds and squares 2 in. and over, 4.23c. base; plates, 4.48c. base; No. 10 blue annealed sheets, 5.48c.; steel bands, 3/16 in. and lighter, 4.98c. base (using the new hand list). Reinforcing concrete bars, 4.25½c., and wire nails, $4.23 per keg base.

Coke.—Reports from the Connellsville district indicate that some improvement in production is noted there, doubtless due to the decreasing number of workmen incapacitated on account of the influenza epidemic. The car supply is also better, and unless the holiday season cuts into production to a larger extent than usual, coke producers should be able early after the first of the year to fill all of their customers' needs without trouble. At the present time, no contracting of any character is being done, but occasionally carloads are being sold for prompt shipment for filling in purposes.

Old Material.—The market is very quiet. A few dealers last week were willing to speculate by taking in some scrap at attractive figures, but all of them now are inclined to wait until after the end of the year. Cancellation requests from founders are still being received, and in some cases these are acted on favorably. However, scrap dealers are inclined to follow the example of pig iron merchants in protesting against cancellations of contracts. The following are buying prices, f.o.b. cars Cincinnati and southern Ohio, in carload lots:

Bundled sheet	$17.00 to $18.00
Old iron rails	28.50 to 29.00
Relaying rails, 50 lb. and up	44.50 to 45.00
Rerolling steel rails	28.50 to 29.00
Heavy melting steel	23.00 to 23.50
Steel rails for melting	23.00 to 23.50
Old carwheels	23.00 to 23.50
Per Net Ton	
No. 1 railroad wrought	$22.00 to $22.50
Cast borings	10.50 to 11.00
Steel turnings	11.00 to 11.50
Railroad cast	23.00 to 23.50
No. 1 machinery	25.00 to 25.50
Burnt scrap	16.00 to 16.50
Iron axles	33.00 to 33.50
Locomotive tires (smooth inside)	28.00 to 28.50
Pipes and flues	17.00 to 17.50
Malleable cast	20.00 to 20.50
Railroad tank and sheet	14.00 to 14.50

Philadelphia

PHILADELPHIA, Dec. 24.

Eastern Pennsylvania steel mills with possibly one or two notable exceptions, adhere to the price schedules which prevailed for many months, still refusing to accept the reduction on the price for plates proposed by the largest interests for either nearby shipment or on future contracts. One of the largest independent mills has actual rolling schedules that will take up full capacity for 60 days and other orders booked equivalent to several months' output which can only partially be relied upon, but the outlook may be clearer in March than it is to-day; hence, the disposition is to await developments. A large tonnage of Government business is still in process of adjustment. Other local mills preserve much the same attitude. It is notable, however, that some outside mills, with local selling offices, have accepted the reduction of $3 a ton on plate for January shipment, having taken some orders on this basis; but all makers are a unit in refusing to apply the lower price schedule to orders previously booked. Some export sales of plate also have been made for January shipment at the full decline, but sales for prompt foreign shipment have commanded substantial premiums.

Two eastern mills have tacitly accepted the reduction of $3 a ton on structural shapes for first quarter 1919 shipment, but few sales of importance have been made. Buyers here and there are testing the mills on prospective business. The scrap situation is chaotic. The few sales made have been at the expense of prices and the tendency is still downward. As far as steel-making iron is concerned, the lower and unsettled market for scrap may be significant.

Iron Ore.—The trade is much interested in the effort being made at Washington to have the Government, through an act of Congress, reimburse domestic miners of manganese and chrome ore, who at the behest of Administration officials expended large sums of money to provide the steel trade with needed alloys at a time when the supply of foreign ores was restricted because of the necessary diversion of ship tonnage to overseas service. It is understood that domestic alloy producers have expended upward of $4,000,000 in Government service and that no funds are available to liquidate this indebtedness. It is the intention, however, that provision be made by an amendment to the Minerals Act by which funds will be made available for the Government to satisfy the just claims of the manganese and chrome ore miners. Manganese ore to-day is still nominally quotable at 80c. per unit, but almost nothing is being done.

Pig Iron.—Producers of foundry and basic iron maintain a firm position. Justifying their stand, they point to extremely light stocks on furnace banks, to orders on sellers' books sufficient to take up current output for four to five months or longer and to scarcity of, with possibly higher prices for coke in the near future. It is freely admitted, however, that demand is light, and that suspension of shipments on contracts in time may create an easier spot market; but this outcome, under present conditions, is not feared. Many furnaces have been operating ceaselessly for a long period and need repairs. If new business continues light and consumers hold back shipments on contracts for several months, producers may take advantage of the lull to make long needed improvements. Sales in the last week have been largely confined to small lots for prompt and January shipment on both domestic and foreign account, but all foundry iron sales have been at the full "Government" price. One inquiry from a New Jersey melter for 1000 tons of basic iron for first quarter shipment is now before the furnaces. One order for 1000 tons of foundry iron for export to Japan in January has been placed and negotiations continue on a round tonnage of standard Bessemer for Europe. Some makers of low phosphorus iron, confronted by somewhat different conditions, are making concessions to attract buyers. One inquiry for 8000 tons for domestic shipment in January has resulted in a sale of 2000 tons of standard low phosphorus free from copper at $51 per ton and copper bearing low phosphorus iron for shipment after the first of the year is available at $48 per ton. These prices represent a reduction of $3 per ton from the "Government" schedule. It is notable, however, that some days ago one sale of 1000 tons of standard low phosphorus iron for delivery over the first half of next year was made at the Government price. It is of interest to note that production of low phosphorus, incidental to war needs, has been doubled in the last year, but not a few furnaces converted from foundry and basic to low phosphorus ore are now preparing to resume peace-time practice. All told, however, the output of these furnaces is relatively small. We quote standard grades of iron for delivery in Philadelphia, except low phosphorus grades, for which f.o.b. furnace prices are quoted:

Eastern Pennsylvania No. 1 X	$40.90
Eastern Pennsylvania, No. 2 foundry	37.90
Virginia No. 2 X	41.75
Virginia No. 2 foundry	40.50
Basic	36.90
Gray forge	36.90
Standard low phosphorus (f.o.b. furnace)	$51.00 to 54.00
Low phosphorus (copper bearing, f.o.b. furnace)	48.00 to 51.00

Ferroalloys.—Few sales of importance were made last week. Ferromanganese is not being pressed for sale on an unwilling market, but the undercurrent is easier because of the lower prices prevailing for manganese ore. There is small call for spiegeleisen either for prompt or future shipment.

Coke.—The light stocks of coke held by some blast furnaces is a source of much uneasiness. The prospect for a larger supply in the near future is not encouraging. Predictions continue to be made that higher rather than lower prices will prevail in January if Government control ceases. No business of importance is reported.

Finished Material.—Interest of the trade in the last week has been largely centered in export transactions. Some mills anxious for business covering shipments in January have been willing to accept 3c. per lb. for structural plate and some business was done on this basis. On the other hand, where exporters were in need of ship plate to apply on contracts calling for shipment before the first of January under penalty of cancellation, they were ready and willing to pay substantial premiums to obtain needed supplies and those mills in position to take advantage of the situation were enabled to secure as high as 3.75c. for several round tonnages, mainly for shipment to Japan. Some domestic business for shipment after Jan. 1 was put through on the basis of 3c. per lb. yet two of the large eastern Pennsylvania mills refused to even consider orders either for prompt or for future shipment under 3.25c. per lb. Mills rolling structural shapes are more inclined to meet the prices quoted by the largest interest. Yet only small tonnages were booked for structural shapes for January shipment. Sales of bars were also light. Domestic railroads being controlled by the Federal Railroad Administration are making no effort to secure rails but there is some inquiry for track supplies. A few inquiries for bridge work that have come out recently have not resulted in business.

Bar Iron.—Manufacturers of bar iron continue to adhere to the base price of 5c. per lb. for best refined, 4.25c. for refined, and 3.50c. for common bars, but the demand is light and no sales of importance are reported.

Old Material.—The market is extremely unsettled and prices are from $1 to $5 per ton lower to effect sales. Many forms of scrap, however, are almost unquotable and prices at the best are nominal. The large tonnage of shell steel hanging over the market has a depressing influence. One eastern Pennsylvania mill that came into the market for heavy melting steel was able to purchase a fair tonnage at $20 per ton, but more being offered at this price, the buyer withdrew. However, there is a difference of several dollars per ton between the asking price and the actual selling price. Sellers are disposed to quote No. 1 heavy melting steel at $23 to $24 per ton. Considerable tonnages of wrought

iron and soft steel pipe were rejected and finally resold at $20 a ton. Ungraded pipe rejected sold as low as $18 a ton. Low phosphorus scrap is most difficult to quote and prices in the table below could probably be shaded several dollars a ton. No. 1 forge fire has been sold at concessions of $1 to $2 a ton; even cast borings which have previously been well sustained are now difficult to sell even at a concession of $2 a ton from quotations of last week.

No. 1 heavy melting steel	$20.00 to $23.00
Steel rails, rerolling	32.00 to 32.50
No. 1 low phosphorus, heavy, 0.04 and under	35.00
Low phosphorus, 0.04 and under	32.00
Low phosphorus, 0.06 and under	27.00
Iron rails	35.00
Carwheels	25.00 to 26.00
No. 1 railroad wrought	32.00
No. 1 yard wrought	29.00 to 30.00
Country yard wrought	25.00 to 26.00
No. 1 forge fire	23.00 to 24.00
Bundled skeleton	23.00 to 24.00
No. 1 busheling	29.00
No. 2 busheling	18.00
Turnings (for blast furnace uses)	15.00 to 16.00
Machine-shop turnings (for rolling mill use)	17.00
Cast borings (for blast furnace use)	15.00 to 16.00
Cast borings (clean)	16.00 to 18.00
No. 1 cast (for steel plant use)	28.00 to 29.00
No. 1 cast (cupola sizes)	32.50
Grate bars	24.50
Stove plate	24.50
Railroad malleable (for steel plants)	29.00
Railroad malleable (for malleable works)	32.50
Wrought iron and soft steel pipes and tubes (new specifications)	25.00 to 28.00
Ungraded pipe	18.50 to 19.50

New York

NEW YORK, Dec. 24.

Pig Iron.—Pig iron sellers have been slowly coming to the conclusion that it will be necessary to adopt the new schedule suggested by the manufacturers who recently conferred with the War Industries Board. While some sales for spot delivery have been made during the past few days at Government prices, it is generally conceded that for delivery after Jan. 1 prices will be $3 lower. Some furnaces, however, especially some in Virginia, are not yet willing to accept the new schedule. We quote prices as follows for tidewater delivery for Northern and Southern grades up to Jan. 1:

No. 1 X, silicon, 2.75 to 3.25	$41.30
No. 2 X, silicon, 2.25 to 2.75	39.55
No. 2 plain, silicon, 1.75 to 2.25	38.30
No. 2 X Virginia, silicon, 2.25 to 2.75	42.95
No. 1 Southern (all rail)	42.95
No. 2 Southern (all rail)	41.70

Cast Iron Pipe.—No action has yet been taken by manufacturers in regard to revision of prices and business is at a standstill. Government prices are $67.70, New York, for 6-in. and heavier; $70.70 for 4-in., $77.70 for 3 in., and $1 additional for Class A and gas pipe.

Ferroalloys.—There continues to be no demand for manganese alloys and quotations continue nominal at $240 to $250, delivered, for 70 per cent ferromanganese and $70, furnace, for spiegeleisen of any grade. The principal topic of discussion in the market is the future of ferromanganese. It seems to be generally conceded that imports of British alloy will soon appear, particularly those having to do with old contracts at low prices. It is a fact that one importer has already secured a license for the importation of such alloy on a recent contract and the announcement this week by the War Trade Board that all restrictions on imports, with special reference to those which involve material sold previous to the imposing of the restrictions, indicates a freer market. Whether there will be, however, much British alloy available for some time is a vital point in the situation. The 50 per cent ferrosilicon market continues dull and unchanged at $140 to $150 per ton on contract, with spot and early delivery ranging from $150 to $160.

Finished Iron and Steel.—Very little interest is being shown by domestic consumers and the market is apparently marking time awaiting developments as to the future level of prices. Not enough business has been transacted in the last week to further test the market and 3c. for plates seems to be the bottom price thus far, with three leading Eastern producers holding firmly at 3.25c. It may be stated in general that Western plate producers and some Eastern mills are freely quoting 3c. on domestic inquiry. One Eastern mill has sold universal plates as high as 3.90c. in the last few days. The new plate mill in the Philadelphia district is already taking orders and it is understood that it will be able to make deliveries in January. Export inquiries continue to predominate and there appeared in the last week two inquiries for about 2000 tons of plates each, as well as one of about 600. The lowest price so far heard of as quoted for export on this class of material is 3.25c., f.o.b. mill. An interesting report in which very little faith is placed is that British makers are offering plates in this market at about 2c. per lb. The structural steel market is practically bare of new business. The American Bridge Co. has been notified orally that it has been awarded the contract for the 24,000 tons of steel on which it was low bidder for the proposed armor plate plant for the Government at Charleston, W. Va. For 1500 tons for a wharf for the Government at New Orleans Levering & Garrigues is announced, as the low bidder. We quote mill shipments as follows: Steel bars, 2.97c.; shapes, 3.07c.; plates, 3.27c.; common bar iron, 3.77c.; and refined bar iron, 5.27c., all New York. Out-of-store prices are 1c higher.

Old Material.—The Government regulation which prevented the sale of carwheels and required railroads to give them to manufacturers in exchange for new wheels has been revoked and for the first time in many months carwheels are coming on the market freely. The price has not yet been definitely determined, but is about $24 to $25. Heavy melting steel has sagged to even lower levels and is quotable now at $15.50 to $16, New York. Rerolling rails and several other lines are also lower. Relaying rails are quoted nominally at $58 to $60, but it is very uncertain as to what price would actually be paid. We quote buying prices of dealers and brokers, per gross ton, New York, as follows:

Heavy melting steel	$15.50 to $16.00
Rerolling rails	22.00 to 23.00
Relaying rails	58.00 to 60.00
Iron and steel car axles	28.00 to 30.00
No. 1 railroad wrought	27.00 to 28.00
Wrought-iron track	24.00 to 25.00
Forge fire	17.00 to 18.00
No. 1 yard wrought, long	23.00 to 24.00
Light iron	6.00 to 7.00
Cast borings (clean)	13.00 to 14.00
Machine shop turnings	13.00 to 13.50
Mixed borings and turnings	13.00 to 13.50
Iron and steel pipe (1 in. minimum diameter), not under 2 ft. long	21.00 to 22.00
Stove plate	19.00 to 20.00
Locomotive grate bars	19.00 to 20.00
Malleable cast (railroad)	18.00 to 19.00
Old carwheels	24.00 to 25.00

Prices which dealers in New York and Brooklyn are quoting to local foundries, per gross ton, are:

No. 1 machinery cast	$28.00 to $29.00
No. 1 heavy cast (columns, building materials, etc.), cupola size	26.00 to 27.00
No. 1 heavy cast, not cupola size	22.00 to 23.00
No. 1 cast (radiators, cast boilers, etc.)	23.00 to 24.00

Increase in output of 75,000 tons in two weeks is held by fuel officials and producers generally as an indication not only that influenza is at last losing its grip on the Connellsville coke region but that the readjustments of peace-time conditions are taking effect. Peace struck the region with output at the bottom figures of 523,721 tons of coal for the week of Nov. 23. The following week, after the ending of the war had been fittingly celebrated, gave a sharp increase of over 50,000 tons.

Industrial accidents in Pennsylvania caused injuries to 12,556 workers in November, according to statistics announced by Walter McNichols, acting commissioner of Labor and Industry. This is the lowest record of any month this year.

Cleveland

CLEVELAND, Dec. 24—(*By Wire*).

Iron Ore.—The ore trade does not look for a buying movement for some time, possibly not until well along in the spring or until the present unsettled condition of the iron and steel market is cleared up. Furnaces are not expected to need ore at the opening season of navigation, as they have put in large stocks, based on the heavy consumption of the war-time period. As stocks in furnace yards are large little ore is moving from docks.

Old range Bessemer, $6.65; old range non-Bessemer, $5.90; Mesaba Bessemer, $6.40; Mesaba non-Bessemer, $5.75.

Pig Iron.—Pig iron producers in this territory have generally accepted the new prices recommended by the committee of the Iron and Steel Institute, and are making quotations at the $3 a ton reduction for delivery after Jan. 1. However, it is stated that two or three of the smaller furnaces that have their order books well filled may adhere to the Government maximum price for the present. The question of reducing prices and of revising contracts already taken were discussed at a meeting of the Central Division of the American Pig Iron Association held in Cleveland, Dec. 18, and the sentiment of the producers was very strongly against revision of contracts to the new prices, and it appears certain that efforts of buyers to secure revisions will be firmly resisted. Southern producers are so far holding out against a price reduction, but were the Southern makers to mark prices down $3 per ton, a wide spread in prices would still exist which would practically shut Southern iron out of the market in this territory. Southern Ohio furnaces are still adhering to the Government price on silvery iron. New demand is very light, although the reduced prices were quoted during the week on a few inquiries. One inquiry has developed for 15,000 tons of basic iron for the first quarter. Foundries generally have good stocks and some are asking for suspensions of shipments. A few additional cancellations have been made of iron allocated on Government work, but which had not reached the point of making formal contracts. We quote delivered Cleveland for December shipment as follows:

Bessemer	$36.60
Basic	33.40
Northern No. 2 foundry	34.40
Southern No. 2 foundry, silicon, 2.25 to 2.75	40.25
Gray forge	33.40
Ohio silvery, 8 per cent silicon	49.90
Standard low phosphorus, Valley furnace	53.00

Finished Iron and Steel.—New demand for finished iron and steel is light, except for plates and sheets, for which there is a fair volume of inquiry for small lots. Many buyers seem to feel that prices may not be maintained at the new levels and are showing hesitation about placing orders. On the other hand, two or three mills have decided that as they have orders to keep their plants busy for some time, they will adhere for the present to the Government prices for delivery after Jan. 1. Little activity is expected until after inventory time. Steel manufacturers are taking a firm stand against revision of contracts for material ordered for specific work, because present steel prices were used as the basis for these contracts, but in the case of material ordered for stock for manufacturing regular products, some of the mills may consent to revision to the new prices. Hard steel bars are now being quoted at 2.70c., the same as soft steel bars, as compared with 3c., or a 0.10c. differential over the latter under Government regulations. Makers as yet are undecided as to whether they will make an extra charge for twisting, which is made by soft steel mills. No change has been made so far in the price of bar iron for which there is practically no demand. Among new inquiry is one for 1700 tons of light plates for building small boats. In structural lines the Canton Bridge Co. has taken 500 tons for an extension to the plant of the Canton Sheet Steel Co. There is little new demand from the automobile industry, but some of the Ohio mills have considerable steel bar tonnage on their books that was placed a few weeks ago by the automobile manufacturers. Sheet consumers have a fair tonnage in stock ordered for Government work, which is now being diverted to commercial uses. A revision of warehouse prices is expected Jan. 1. Jobbers' quote:

Steel bars, 4.07c.; plates, 4.42c.; structural material, 4.17c.; No. 10 blue annealed sheets, 5.42c.; No. 29 black sheets, 6.42c.; No. 28 galvanized sheets, 7.67c.

Old Material.—A little inquiry is coming from the mills for scrap but no buying by consumers is expected until after the first of the year. At present, there are no regular prices for any kind of material and the uncertainty as to what the prices will settle down to when the buying movement starts still exists. Dealers are trying to clean up their contracts before the end of the year, but are unable to do so, as one Cleveland mill is embargoed and another has held up shipments. Trading between dealers is light and these sales are being made at a rather wide range in prices. There is a great deal of scrap on the market. Borings and turnings have eased off about $1 a ton owing to the fact that a Cleveland consumer is not taking shipments. We quote f.o.b. at consumers' yards in Cleveland and vicinity as follows:

Steel rails	$26.00 to $27.50
Steel rails, under 3 ft.	29.00 to 30.00
Steel rails, rerolling	32.50 to 33.50
Iron rails, nominal	36.00
Iron car axles, nominal	40.00
Steel car axles, nominal	46.50
Heavy melting steel	26.00 to 27.00
Cast borings	16.00 to 16.50
Iron and steel turnings and drillings	16.00 to 16.50
Compressed steel scrap	24.50 to 25.00
No. 1 railroad wrought	32.00 to 33.00
Cast iron car wheels, unbroken, nominal	27.00
Cast iron car wheels, broken, nominal	30.00
Agricultural malleable	22.00 to 23.00
Railroad malleable	32.00 to 33.00
Steel axle turnings	22.00 to 22.50
Light bundle sheet scrap, nominal	22.00 to 22.50
Cast iron	26.00 to 27.00
Cast iron, broken, nominal	30.00
No. 1 busheling	26.75 to 27.00
Railroad grate bars, nominal	23.00 to 24.00
Stove plate, nominal	23.00 to 24.00

Alloy Steel.—The demand for alloy steel is light. Automobile companies are placing only fill-in orders for small tonnages. It is stated that some of the automobile manufacturers have not cleaned up as rapidly as expected on Government orders and have been correspondingly delayed in getting back to their regular production. Prices on standard open-hearth alloy steels have eased off about 25c. per lb. except on vanadium steel. The supply of vanadium steel is scarcely equal to the demand owing to the sinking during the fall of two cargoes of vanadium concentrates. It is not expected because of this shortage that the ferrovanadium alloy situation will become normal before April or May. Because of the scarcity, some spring manufacturers may decide to use some special steel other than vanadium steel for springs. Deliveries on standard alloy steels are from two to six weeks, the more extended deliveries being on 2 in. and larger bars. Open hearth alloy steel is quoted at 7.25c. to 7.50c. for low chrome nickel and 8c. to 8.25c. for 3½ per cent nickel steel, and 7.75c. to 8c. for vanadium steel.

A site having a frontage of 1145 ft. on the Buffalo River, at the foot of Childs Street, Buffalo, has been purchased by the Marine Elevator Co., C. Lee Abel, president, Chamber of Commerce Building, and plans are being drawn for a reinforced concrete and steel grain elevator and power house to be erected next spring. A fairly large tonnage of steel and considerable elevating equipment will be required. The estimated cost of the elevator is between $1,500,000 and $2,000,000.

A free night school for safety engineers, with the men in charge of safety work at some of the largest industrial plants of the country acting as instructors, will be instituted by the Safety Council of the St. Louis Chamber of Commerce on the night of Jan. 3, to run weekly until April 11. The school will be conducted by Carl Smith, secretary of the Central Mississippi Valley Division of the National Safety Council, who will also act as advisor to student safety engineers between sessions.

Birmingham

BIRMINGHAM, Ala., Dec. 23.

Pig Iron.—Disposition to accept the $31 basis for foundry iron for 1919 delivery is more marked than it has been, that being the schedule adopted by the leading interest. Although that company admits it has no iron for sale, it has forced the independent iron masters to regard it as the new schedule, at least a tentative standard. As practically no new 1919 business has been taken on for domestic consumption since the steel interests announced the cut, there is no actual basis on which to figure transactions. Alabama furnace interests admit, however, that, where off iron develops that is to be offered the trade, it will take whatever price may be obtained. On Friday of last week, one company announced that it would consider commitments for first quarter and even first half of 1919 for regular customers at $31. The leading company, on the other hand, made a sale of a small quantity of metal for export at $34 and it is reported that 5000 to 6000 tons was taken on by another company at this figure for 1919 delivery. Summing it up, it does not appear that 1919 business may as a rule be booked at this time at over $31, certainly not in quantity. Makers, however, seem inclined to believe that this lower level will soon be replaced by higher ones incident to the demand which they expect. It is possible that the export demand, which is more insistent than the domestic, will accept the higher prices, especially for prompt shipment in the new year. The independent makers fully realize that a competitive market has been restored and that, therefore, the lowest price named by a large interest sets the pace. They will sell as little as possible in the immediate future in the hope of a rise and their well-filled order books will enable them to rest a while without worry. Alabama comes to the new year with a production of 2,500,000 tons compared with one of nearly 3,000,000 in 1918 and no stocks worth mentioning. In this respect the southern market is strong. Furnace practice has but slightly improved. The Talladega furnace is still idle owing to the caving in of its lining during the first part of the month. This stack has manufactured about 5000 tons of metal, which has gone to Japan. We quote per gross ton f.o.b. Birmingham district for immediate delivery as follows:

No. 2 foundry and soft	$34.00
Basic	33.00

Cast Iron Pipe.—There has been no change in the cast iron pipe situation, which may be said to be dull in the extreme, with war orders gone and very few peace orders to take the place. Practically all the sanitary shops will close for the holidays and are not slated to resume, in many instances, until Jan. 15. Water pipe concerns will resume earlier.

Coal and Coke.—The coal output has again increased, going to 386,000 tons for the past week, compared with 381,000 the preceding week and 322,000 the week before that. There is enough foundry coke to go around, but furnace interests are kept busy trying to maintain their supply. The leading interest shut down all its beehive ovens in order to have supply of coal ample for its by-product operations.

Old Material.—Scrap has continued its toboggan ride with seeming inability to stop it. The market is practically a dead one, with prices still lower. We quote per gross ton f.o.b. Birmingham district yards, prices to consumers as follows:

Old steel axles	$30.00 to $32.00
Old steel rails	20.00 to 21.00
Heavy melting steel	18.00 to 19.00
No. 1 railroad wrought	23.00 to 24.00
No. 1 cast	23.00 to 24.00
Old carwheels	23.00 to 24.00
Tram carwheels	22.00 to 23.00
Machine-shop turnings	10.00 to 10.50
Cast-iron borings	10.00 to 10.50
Stove plate	16.00 to 17.00

The National Steel Co.'s plant at Bessemer, Ala., representing an investment of $200,000, is nearing completion. It will make railroad devices and parts for shipbuilding.

Buffalo

BUFFALO, Dec. 23.

Pig Iron.—During the past week furnacemen have apparently arrived at more settled and formulated ideas concerning the sales policies they will adopt for the opening of the new year, on new business and as a rule the conclusion seems to have been reached that the price schedule recommended by Judge Gary as chairman of the Steel Committee at Washington, $3 per ton under the existing Government scale, will prevail after Jan. 1. Some contracts are now being made on that basis for tonnages that can be taken on for first half delivery. Most furnacemen state that for unfilled contracts entered at the Government prices they will ask customers to accept iron at the booked price, even though delivery runs over into first half of next year. Most furnaces are pretty well sold up for at least three or four months ahead, but have iron for sale for the latter part of the first half and are now selling for unfilled dates. Very few, however, are attempting to book commitments for third quarter.

We quote the existing Government schedule to Dec. 31, f.o.b. furnace, Buffalo, with the understanding that a reduction of $3 per ton will go into effect on Jan. 1, applying on new business booked for delivery after that date:

No. 1 foundry, 2.75 to 3.25 silicon	$37.00
No. 2 X, 2.25 to 2.75 silicon	35.25
No. 3 foundry, 1.75 to 2.25 silicon	34.00
Gray forge	33.00
Malleable, silicon not over 2.25	34.50
Basic	33.00
Bessemer	35.20
Lake Superior charcoal, regular grades, f.o.b. Buffalo	38.50

Old Material.—The scrap market is stagnant; with prices demoralized and buying practically suspended, at least until after the holiday season and the inventory period. The general conditions are so uncertain and dubious at the moment that buyers do not care to venture to even a small extent. Heavy melting steel shows further recession in price with negligible inquiry and no demand whatever in cupola grades. Rejections are increasing and dealers think without adequate reason and serious developments are threatened in some instances on this account. The demand for low phosphorus scrap is at a very low ebb, almost at the vanishing point, and there are very few indications at present of a revival after the first of the year. It is stated that dealers who have been handling metals and brass and copper scrap have been subject to big losses on account of the decline in prices, wiping out all recent profits in many instances. The following is the present price schedule, per gross ton, f.o.b., Buffalo:

Heavy melting steel regular grades	$24.00 to $25.00
Low phosphorus, 0.04 and under	29.00 to 30.00
No. 1 railroad wrought	27.00 to 28.00
No. 1 machinery cast scrap	29.00 to 30.00
Iron axles	37.00 to 38.00
Steel axles	37.00 to 38.00
Carwheels	27.00 to 28.00
Railroad malleable	29.00 to 30.00
Machine shop turnings	15.00 to 16.00
Heavy axle turnings	20.00 to 21.00
Clean cast borings	16.00 to 17.00
Iron rails	28.00 to 29.00
Locomotive grate bars	23.00 to 24.00
Stove plate	25.00 to 26.00
Wrought pipe	21.00 to 22.00
No. 1 busheling scrap	22.00 to 23.00
Bundle sheet stamping scrap	21.00 to 22.00

Finished Iron and Steel.—Mills and sales agencies are now entering some tonnage at the new prices on such items as are to take a lowered scale for shipment after Jan. 1, but are shipping against present contracts and invoicing at the contract or sales price made when the contract was entered. It has not yet been clearly established what action will be taken regarding material for export into Canada, whether same will be held to old prices or new arrangements made. The market is comparatively quiet this week, both as regards inquiry and sales on account of the inventory and holiday season. It is understood that a uniform contract will be adopted by at least some of the leading steel companies effective on tonnage contracted for, for shipment after Jan. 1. While the forms of these new con-

tracts have not yet been presented to the trade, it is stated they will embody some radical changes in the old methods of accepting contracts.

British Steel Market

Foundry Iron in Demand—Makers Unwilling to Book Far Ahead—Export Steel Contracts

(By Cable)

LONDON, ENGLAND, Dec. 24.

There is a big demand for foundry iron but supplies are short and furnace operations are irregular. Makers are unwilling to book far ahead owing to the uncertainty of conditions. Nothing is available for the consumption of neutrals. Cancellations of old unexecuted export steel contracts seem certain because of the official demand that overseas buyers shall pay the government difference between the actual contract price and the new fixed export price. Following are the revised official domestic prices for steel applicable after Feb. 1, 1919, per gross ton, net f.o.b. makers' works:

Ship, bridge and tank plates, £14 [£11 10s.].*
Boiler plates, £15 [£12 10s.].
Ship, bridge and tank plates, thin, £16 [£14 10s. to £17 10s.].
Angles and bulb angles, £13 12s. 6d. [£11 2s. 6d.].
Small angles, tees and flats, £16 10s. [£14 to £16].
Beams, £13 12s. 6d. [£11 2s. 6d.].
Rails, 60 lb. per yd. and upward, £13 7s. 6d. [£10 17s. 6d.].
Rounds, squares and hexagons, £14 5s. [£12 10s. to £13].
Small rounds, squares and hexagons, £16 10s. [£15 to £15 10s.].
Blooms, billets and slabs for rolling, £11 12s. 6d. [£10 7s. 6d.].
Blooms, billets and slabs for forging, £12 15s. [£11].
Ingots for rerolling, £9 5s.

*Prices in brackets are the official control prices for domestic business effective till Feb. 1.

(By Mail)

Labor Troubles Appearing—Export Prices for Steel—New Ships for Cunard Fleet

LONDON, England, Nov. 27.—Prompt relaxations in the trade restrictions were made after the armistice, the Ministry of Munitions announcing that iron and steel makers were free to accept orders for priority below Class B and to use for manufacturing purposes in connection therewith any materials in stock subject to any existing price restriction. In case of stocks held by the contractors but the property of the government, terms would be arranged, but material would only be released to satisfy reasonable immediate needs. Following upon this prices were fixed for deliveries for export on and after Nov. 16, 1918, until further notice, except for deliveries under contracts made prior to Nov. 16, for which priority certificates and export licenses have already been obtained. These prices are for delivery f.o.b. port of shipment for net cash against documents, and apply equally to makers, merchants and agents. Makers may, however, allow to merchants or agents a discount not exceeding 1¼ per cent. A merchant or agent purchasing steel for export shall make a declaration in writing to the steel makers to that effect in respect of each of such purchase.

	Fixed Basis Prices		
	£	s	d
Ship, bridge and tank plates	16	10	0
Boiler plates	17	10	0
Chequer plates	18	0	0
Ship, bridge and tank thin plates	19	10	0
Angles and other sectional material	16	2	6
Small angles, tees and flats	20	0	0
Beams	16	2	6
Rounds, squares and hexagons	17	10	0
Small rounds, squares and hexagons	20	0	0
Rails, 60 lb. and over	15	10	0
Rails, 50 lb. and over, but under 60 lb.	15	12	6
Billets, ordinary	13	10	0
Billets, special	15	0	0

The extras are the same as for domestic sales.

The limitation of the merchants' profit to 1¼ per cent will check merchant business here, for it will not be worth doing, while the prices fixed above are regarded as being far too high.

Home trade prices at the last fixing include the following:

Basis prices for small angles, tees, channels and flats ¼ in. thick and upwards, are for lots of 10 tons of one size in one specification, for one destination under same date.

Angles:

Six united inches under ½ in. thick and under 6 down to and including 4 united inches
Six united inches under ½ in. thick and under 4 down to and including 3 united inches
Six united inches under ½ in. thick and under 3 down to and including 2 united inches
Six united inches under ½ in. thick and under 2 united inches
Extra for thickness:
Under ¼ in. thick
Under 3/16 in. to ⅛ in.

Tees:

Under 6 down to and including 4 united inches... 16 0 0
Under 4 down to and including 3 united inches... 16 10 0
Under 3 down to and including 2 united inches... 17 0 0
Under 2 united inches... 18 0 0
Extra for thickness:
Under ¼ in. thick
Under 3/16 in. to ⅛ in. thick

Channels:

Under 6 in. to 5 in. wide, usual thickness for size. 16 5 0
Under 5 in. to 4 in. wide, usual thickness for size. 16 10 0
Under 4 in. to 3 in. wide, usual thickness for size. 16 15 0
Under 3 in. to 2 in. wide, usual thickness for size. 17 0 0

Flats:

Five in. wide and under down to and including 1 x ¼, also 8 in. wide and under ⅜ in. thick and under... 15 0 0
Extras in accordance with bar iron extra list, Nov. 1, 1916, omitting extras for areas.

Extras for Quantities:

Under 10 tons but not less than 2 tons of one size as specified above
Under 2 tons per size as specified above

Extras for Cutting to Lengths:

Two ft. and up to 3 ft. with 1 in. margin under or over
Over 3 ft. and up to 35 ft. with 1 in. margin under or over
Over 35 ft. and up to 40 ft. with 1 in. margin under or over
Over 40 ft. and up to 45 ft. with 1 in. margin under or over
Special extras of not less than 10s. per ton for 2 ft. and under.

Extras for Tests:

The basis price includes test up to 28 to 32 tons tensile. Where machined tests are called for an extra not exceeding 20s. 9d. lump sum may be charged for each machined test made.

It is believed that the export prices will be modified monthly after February, 1919, but no official announcement has been made to this effect.

As regards trade, conditions are very difficult. Labor troubles are rife already, affecting particularly the North East steel works. There is plenty of work booked to keep plants going, and makers are inundated with inquiries, but prices are so high that it is feared buyers will not pay them, preferring to await events. Blast furnaces are working very irregularly. All the iron is wanted, but the car shortage is a great obstacle and metal is being stored.

Galvanized sheets are quoted at about £30 f.o.b., but some makers ask as much as £33. There are inquiries, but buyers will not pay the price. India, for instance, suggests £17 as a possible figure for business, which is absurd. There are plenty of orders for tin plates, but here the shortage of labor intervenes. Tin bars are reported to have been raised to £10 17s 6d against £10 7s 6d, and largely increased supplies should be available, but it will take time for the mills to recover labor to take advantage of the augmented tonnage of steel.

The greatest activity prevails in the shipyards, and Vickers Ltd. have booked an order for several liners for the Cunard fleet, two of which vessels will be laid down at once at Barrow.

The Pennsylvania Rail Co., Lebanon, Pa., at its mill at Danville, Pa., located on the Philadelphia & Reading and also on the Delaware, Lackawanna & Western Railroad tracks, is now rolling mine rails 20, 25, 40 and 45 lb. per yard.

MANGANESE-ALLOY FURNACES*

Effect of Low-Ash Coke on Yield of Ferromanganese and Spiegeleisen

In recent months 12 typical blast furnaces producing ferromanganese and spiegeleisen have been fully investigated by the Bureau of Mines. These furnaces produce approximately 40 per cent of the total output of manganese alloys of the United States and offer a very fair cross-section of the industry as a whole.

It has been developed that the poor quality of the coke in general use is responsible for serious waste both of manganese and of coke. This fact is of vital interest not only to the War Minerals Investigations, but also to the Fuel Administration.

The 12 furnaces which have been studied furnish the following statistics:

	Making Ferromanganese	Making Spiegel
Number of furnaces investigated	6	6
Average total tons monthly output of alloys (July and August)	9,966	11,736
Average tons coke per ton of alloy	3.25	2.12
Total tons coke consumed	32,387	24,880
Average per cent Mn in alloys	73.0	17.5
Tons metallic manganese in alloys	7,266	2,100
Conversion loss, per cent	29	38
Tons metallic manganese in ores	10,266	3,380
Average per cent Mn in ores	40.6	12.8
Total tons of ore consumed	25,276	26,502

A total of about 57,000 tons of coke per month are consumed by the 12 furnaces under review. This coke was found to contain an average of nearly 14.5 per cent ash, or over 7 per cent silica.

The principal losses of manganese in the manufacture of alloy are due to slag, these losses being roughly proportional to the slag volume. The controlling slag-forming element is silica. Silica in coke is more harmful than silica in ore because it not only increases the slag volume but also diminishes the efficiency of the coke, making more coke necessary, which in turn introduces more silica, thereby again increasing the slag volume and so once more raising the coke requirement. In fact, if the coke contains as much as 20 per cent ash, the vicious circle may be complete, all further additions of coke serving no purpose whatever. It is obvious that the more nearly this extreme is reached, the more wasteful the process becomes, both as to manganese and as to coke. Conversely, with better coke, less coke is needed and more manganese is saved.

It can be demonstrated on the ground of comparative observations actually made and recorded that if the 12 furnaces under review had been supplied with coke containing 8 per cent ash instead of 14.5 per cent, the same monthly tonnage of alloys could have been produced with about 40,000 tons of coke instead of the 57,000 tons actually used. At the same time the conversion loss of metallic manganese would have been reduced from 29 per cent to 14 per cent for ferromanganese and from 38 per cent to 29 per cent for spiegel. The net result of this last would have been a saving of 1826 tons of metallic manganese, equivalent to 4560 tons of 40 per cent ore in the case of ferromanganese; and a saving of 420 tons of metallic manganese, equivalent to 3230 tons of 13 per cent ore in the case of spiegeleisen.

If we extend these figures, which represent actual conditions as to about 40 per cent of the country's present output of manganese alloys, so as to cover the entire estimated requirement of such alloys for the year 1919, we get the results given.

In short, by allocating low-ash coke during 1919 to the manganese-alloy furnaces, there may be saved over half a million tons of coke; about 131,000 tons of manganese ore of ferromanganese grade; about 84,000 tons of ore of spiegel grade; and a total of about 64,000 tons of metallic manganese.

The effect of such allocation on the production of pig iron must, however, be considered. The pig-iron industry would be deprived of roughly 1,200,000 tons of good coke and receive instead about 1,700,000 tons of relatively poor coke.

In the manufacture of pig iron, poor coke does not cause any increase in loss of metallic iron. The substitution of 14.5 per cent ash coke for 8 per cent ash coke would, however, cause about 10 per cent decrease in production and about 20 per cent increase in the use of coke. The decrease in production is the direct result of having to use an increased amount of coke. The net effect would be a decrease in the production of pig iron of about 120,000 tons, and an increase in coke consumption of about 240,000 tons; 120,000 tons is approximately one-third of 1 per cent of the total pig-iron output of the country.

But since the pig-iron industry would receive 500,000 tons more coke than it would be asked to give away, there would be sufficient coke after supplying the above additional requirement of 240,000 tons to fully make up the deficiency in pig iron and still leave a margin of 120,000 tons. The net coke supply would therefore be actually increased, while maintaining the pig output at its present level; but about 130,000 tons additional furnace capacity would have to be provided.

The greater part of this, namely, at least 100,000 tons, would be furnished by the manganese-alloy industry; since its furnace requirements would be reduced by this amount, while producing the same tonnage of alloys, on account of having high-grade coke. The small balance must be made up from some other source.

Without doubt, a large proportion of the furnaces idle are small and poorly equipped. But, in view of the immense national importance of this matter of allocating low-ash coke to the manganese-alloy furnaces, it would seem justifiable to exert pressure on the pig-iron industry to make up the resulting slight loss of furnace capacity from among the furnaces now idle.

The figures given in the foregoing pages are based on a grade of coke which is to-day admittedly scarce; on the other hand, the total requirements of the manganese-alloy furnaces are only a small proportion of the total coke output of the country. The best coke available, whatever its grade may be, should be allocated to these furnaces; and if the average ash proves to be somewhat more than 8 per cent, the savings made, while proportionately less than shown above, will still be of the utmost importance.

In making these figures, commercial aspects have been constantly kept in mind. The figures are not theoretical; they represent what it is believed can actually be accomplished.

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1. Estimated requirement for 1919, 280,000 tons metallic manganese of which 20 per cent shall be in the form of spiegeleisen.

	Tons Coke
2. 56,000 ÷ 17 per cent = 330,000 tons spiegel × 2.12 =	699,600
224,000 ÷ 72 per cent = 312,000 tons ferro × 3.25 =	1,014,000
Total requirement of 14.5 per cent ash coke	1,713,600
Saving through use of good quality coke, 31 per cent	532,000
Total requirement of 8 per cent ash coke	1,181,600

	Poor Coke	Good Coke	Saving
3. Spiegel conversion loss, per cent.	38	29	
Tons Mn needed for spiegel	90,000	79,000	11,000
Tons 13 per cent ore needed for spiegel	630,000	606,000	84,000
Ferro conversion loss, per cent	29	14	
Tons Mn needed for ferro	315,000	262,000	53,000
Tons 40 per cent ore needed for ferro	786,000	655,000	131,000

*From War Minerals Investigation Series, No. 4, entitled "Note on the National Importance of Allocating Low-Ash Coke to the Manganese-Alloy Furnaces," by P. H. Royster, issued by the Bureau of Mines.

Details of an optical pyrometer for controlling the temperature of gas furnaces is given in the *Bulletin des Usines de Guerre*. Two squares of colored glass are illuminated by transmitted light from an electric lamp, the tints of the glass being so chosen as to correspond to the color of the furnaces at the maximum and minimum permissible temperatures.

Book Review

Hendrick's Commercial Register of the United States. Pages, 2381, 7½ x 10 in. Published by S. E. Hendricks Co., Inc., 2 West Thirteenth Street, New York. Price, $10.

The twenty-seventh annual edition of this register covers the same field and follows the same arrangement as the previous edition. The contents have been revised and corrected as nearly as possible to date of publication. The main portion of the book is a comprehensive register of producers, manufacturers, dealers and consumers of the products used by the iron and steel, mechanical, hardware, engineering, railroad, architectural, electrical, quarrying, contracting and kindred industries of interest to buyers and sellers. An alphabetical section introduced in last year's issue contains in one list the name, trade description and address of every company that appears in the main portion of the book. A list of trade names, brands, etc., covering 216 pages, printed on pink paper, separates the alphabetical section from the main portion of the book.

A paper on "High Speed Internal Combustion Engines," by Harry R. Ricardo, complete with discussion, correspondence and author's reply, is printed in Part 6, Vol. XXXIV, of the Transactions of the North-East Coast Institution of Engineers and Ship Builders, Bolbec Hall, Newcastle-Upon-Tyne, England. The author examines and points out some of the features of high speed engine design, and indicates points upon which the designers of these engines have concentrated their attention. Section headings, indicative of the scope of the paper, are as follows: Mechanical efficiency, piston friction, fluid pumping losses, volumetric efficiency, piston design, bearing pressures, comparative wear and tear of slow and high speed engines. Numerous charts and illustrations add to the value of the article.

"The Economical Use of Coal in Railway Locomotives" is the subject of Circular No. 8, prepared by the Engineering Experiment Station of the University of Illinois. The purpose of the circular is the helping of railway officials and employees in their efforts to save coal. While it contains little that is new, it presents a simple statement of the facts concerning the choice, distribution, storage and use of coal, and offers some conservative suggestions concerning the ways in which coal may be burned economically. The text is supplemented by numerous illustrations, some of which are in colors. Copies can be obtained at 20 cents apiece from the Engineering Experiment Station, Urbana, Illinois.

"The Present Development of Transmission Lines in Kansas" is the subject of Engineering Bulletin No. 10, issued by the University of Kansas. The publication is a survey of the development of the power transmission business in Kansas, with an appendix devoted to the calculation of iron transmission lines. Illustrations and numerous statistical tables are included. The author, F. Ellis Johnson, is assistant professor of electrical engineering at the University of Kansas.

The *Marine Review* has compiled a list of names and addresses of responsible shipbuilders of the United States and Canada, arranged according to States. The name of the company, location and principal offices are given. The list is in loose-leaf form, as it is the intention to issue, whenever necessary, supplementary sheets embodying changes in names and personnel. Published by the Penton Publishing Company, Cleveland, Ohio.

"Boiler and Furnace Testing," by Rufus T. Strohm, is the title of Engineering Bulletin No. 1, issued by the United States Fuel Administration. The purpose of the bulletin is to conserve coal by the more efficient operation of boilers. Copies are obtainable from the Conservation Bureau of the United States Fuel Administration, Washington, D. C.

The "Flow of Water Through One and One-Half Inch Pipe and Valves" is discussed in Bulletin No. 1 issued by the engineering experiment station of Purdue University, Lafayette, Ind. The purpose is to furnish information concerning the losses of head and to develop equations that may be of use in predicting such losses. The experiments upon which the results and conclusions are based were made in the hydraulic laboratory of the university. A total of 270 experiments were made, comprising over 6000 readings of gages, time, weights and temperature. Illustrations, diagrams, charts and tables are included.

"Yards" is the subject of issue No. 17 of *Safe Practices*, published by the National Safety Council, 208 South La Salle Street, Chicago. Section headings include: Plant layout; grading and drainage; entrance and exit gates for railroad tracks, wagons and trucks, pedestrians; protection at railroad tracks; pits, depressed roadways and obstructions; unloading material; piling of material; yard clearance; car equipment; locomotive cranes; care of yard tools; electrical hazards; signs; lighting the yards; plant cleanliness.

"Power Presses" is the subject of Bulletin 18 issued by the National Safety Council, 208 South La Salle Street, Chicago. Subjects discussed include causes of accidents, automatic feed, blanking, forming, die making, repeating and accidental tripping, treadle guard, starting and stopping, repairing and cleaning, location and lighting. Illustrations of automatic feeds, locking devices, guards and various other safety devices are given.

Elevator Manufacturers' Convention

The Elevator Manufacturers of the United States held their semi-annual convention at the William Penn Hotel, Pittsburgh, recently. Among the subjects discussed were cost systems, co-operative service, elevator regulations, service stations, and the prospects of the industry. Among the features of the occasion were a banquet, a theater party, and a trip to the works of the Westinghouse Electric & Mfg. Co. The following officers were elected for the coming year; President, I. N. Haughton, Haughton Elevator Co., Toledo; vice-president, O. P. Cummings, A. B. See Electric Elevator Co., New York; secretary, Frank A. Hecht, Jr., Kerstner & Hecht Co., Chicago; treasurer, J. H. DeVere, Ohio Elevator Co., Columbus.

The Donner-Union Coke Corporation, Buffalo, has filed plans with the bureau of that city for the construction of brick and steel buildings at its new plant at Abby and Lehigh streets, Delaware, Lackawanna & Western Railroad Company and the Buffalo River, as follows:

By-product building, to cost	$100,000
Benzol building, to cost	50,000
Ammonia still and pump building, to cost	22,000
Naphthalene building, to cost	5,000
Boiler house, to cost	52,000
Machine shop, to cost	17,000
Laboratory, to cost	4,000
Reinforced concrete coal bins, to cost	100,000
Service building, etc.	28,000

The Pennsylvania Rail Co., Lebanon, Pa., has completed an arrangement whereby mine rails are produced for it by the Pennsylvania Brake Beam Co., at its mill at Danville, Pa., on a conversion contract. H. C. Gable, president of the company, was formerly general sales agent of the American Iron & Steel Mfg. Co., whose plants at Lebanon and Reading were acquired last year by the Bethlehem Steel Co.

The Mobile Shipbuilding Co., parent organization of the Birmingham Steel Corporation, announces a considerable expansion of its steel shipbuilding plant at Mobile, Ala. The Birmingham company announces that work on another $1,000,000 unit will be started as soon as the present one is completed, which is expected to be early in 1919.

Neville Island Ordnance Plant Will Be Completed

Assistant Secretary of War Crowell states that the Government ordnance plant at Neville Island will be completed.

The Neville Island project contemplated the expenditure of $65,000,000 in order to furnish new facilities for big gun manufacture, and the plant is to be equipped to produce 18-in. or larger rifles if necessary, although the maximum sizes now in process are the several 16-in. types. The new plant will turn out big guns of all calibres, however, including the forgings, all of which the Government has heretofore obtained from private concerns.

Instead of rushing the plant to completion, however, Mr. Crowell said the idea was to allow it to develop naturally with the usual year to year appropriations. He also said that the War Department would urge encouragement of private enterprise in order to keep some part of the emergency war machinery of industry always in operation. It is understood that the United States Steel Corporation will divorce itself from the project.

Will Not Build Picric Acid Plant

Construction of the picric acid plant in Grand Rapids, Mich., will be abandoned at once by the Government, according to official announcement of Major W. P. Rothrock, construction quartermaster, who has just returned from Washington. All contracts will be terminated as quickly as possible and the 500 employees will be retained only long enough to clean up the materials and equipment. No buildings will be torn down, as it is the hope of the Government that they will be purchased and utilized by some person or corporation in the manufacture of peace-time products.

The plant is now about 60 per cent complete, and the Government expenditures to date amount to $1,300,000, with obligations incurred by and including expenses of, the construction quartermaster, totaling about $4,500,000. There are about eight miles of railroad siding to each of the buildings, and about two miles of very good vehicle roads with gravel surface.

Higher Wage Rate for Stove Molders

A 10 per cent advance in the wages of stove founders, making the day rate $5.75 for six hours molding, was agreed upon at the recent conference of the Stove Founders National Defense Association and the International Molders Union of North America.

The Sub-Committee on Scrap Iron and Steel of the American Iron and Steel Institute has not, as reported, sent out a letter to dealers stating that contracts for deliveries after Jan. 1 should be adhered to by all concerns. A letter was sent out by the American Board of Scrap Iron Dealers, in which some reference to contracts was made, but the Institute committee has not been dealing recently with questions of contracts and, ceased to exist on Dec. 21.

Back to a 100 per cent peace basis, after having been for many months on a 100 per cent war basis, without laying off a man, is the accomplishment of the Michigan Tool Co., manufacturer of machine tools, at 264 Jefferson Avenue, Detroit, which has enlarged its quarters five times since it was organized in August, 1915.

Fires have been lighted in the furnaces of the new steel mills of the Tennessee Coal, Iron & Railroad Co. at Fairfield, Ala., to warm them up in preparation for operation. The new plants consist of a 40-in. blooming mill, 26-in. structural mill, 110-in. plate mill, angle and plate shop, etc.

The Donner Steel Co., Buffalo, has increased its capital stock from $11,000,000 to $13,000,000.

IRON AND INDUSTRIAL STOCKS

General Decline in Values—Liberty Bonds Still Being Heavily Sold

NEW YORK, Dec. 23.

Stock market conditions the past week have been unfavorable for holders of securities. Heavy selling of Liberty bonds has continued. Railroad stocks and bonds have declined, indicating lack of confidence in early action by Congress. Industrials have receded, some because of the abandonment of Government price-fixing on their products and others because cancellations of Government contracts have restricted manufacturing operations, thus clouding dividend prospects. Stocks or bonds which show no decline from prices ruling a week ago are shining exceptions to the general experience.

The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week is as follows:

Allis-Chalm. com.	30 - 32	Gt. No. Ore Cert.	32¼ - 33
Allis-Chalm. pf.	84	Gulf State Steel.	58⅞ - 60
Am. Can com.	46 - 48	Int. Har. com.	110 - 111¼
Am. Can pf.	96½ - 97	Lackaw. Steel	67⅛ - 69
Am. Car & F. c.	85¼ - 88	Lake Supr. Corp.	17¾ - 18
Am. Loco. com.	60¾ - 63	Midvale Steel	44¼ - 45⅝
Am. Loco. pf.	100	Nat.-Acme	29¼ - 30
Am. Ship com.	118⅞	Nat. En. & Stm. c.	45½ - 46
Am. Steel Fdries.	83⅝ - 86½	N. Y. Air Brake.	102⅜ - 103
Bald. Loco. com.	73½ - 76¾	Nova Scotia Steel.	55⅛
Beth. Steel com.	60¾ - 63⅝	Ry. Steel Spg. c.	72 - 74⅝
Beth. Stl. Cl. B.	61⅜ - 63⅝	Ry. Steel Spg. pf.	103
Cambria Steel	115½	Republic com.	74¼ - 75½
Case (J. I.) pf.	92	Republic pf.	97½
Cent'l Fdry. com.	19	Sloss com.	49 - 51
Central Fdry. pf.	36	Superior Steel	35 - 36
Chic. Pneu. Tool.	65 - 68	Un. Alloy Steel.	38¼ - 39
Colo. Fuel	38⅞ - 39½	U. S. Pipe com.	14⅞ - 15½
Cruc. Steel com.	56⅞ - 58	U. S. Steel com.	94⅜ - 97⅛
Crucible Steel pf.	87 - 87⅝	U. S. Steel pf.	112⅛ - 112¾
Deere & Co., pf.	95¼	Va. I., C. & Coke.	56
Gen. Electric	146⅜ - 151¼	Westingh. Elec.	42¾ - 43⅜

Dividends

The American La France Fire Engine Co., Inc., quarterly, 1½ per cent on the common, payable Feb. 15 and 1¾ per cent on the preferred, payable Jan. 2.

The Babcock & Wilcox Co., quarterly, 2 per cent, payable Jan. 3.

The Canadian Car & Foundry Co., quarterly, 1¾ per cent, payable Jan. 10.

The Chicago Railway Equipment Co., quarterly, 1¾ per cent, payable Jan. 1.

The Hendee Mfg. Co., quarterly, 1¾ per cent, payable Jan. 2.

Manning, Maxwell & Moore, Inc., quarterly, 1½ per cent, payable Jan. 2.

The Sloss-Sheffield Steel & Iron Co., quarterly, 1¾ per cent on the preferred, payable Jan. 2.

The Trumbull Steel Co., quarterly, 1½ per cent and extra 2½ per cent on the common, and 1¾ per cent on the preferred, payable Jan. 1.

The Westinghouse Air Brake Co., quarterly, $1.75, payable Jan. 31.

The Youngstown Sheet & Tube Co., quarterly, 2 per cent and extra 3 per cent on the common and 1¾ per cent on the preferred, payable Jan. 1.

Creditors of the Wemlinger Steel Piling Co., 149 Broadway, New York, have filed a petition in bankruptcy against the company. The liabilities are said to be $40,000 and the assets considerably less. Harry W. Arnold has been appointed receiver. The company's plant is located at Poughkeepsie.

The American Brass Forging Co., 168 Southern Boulevard, New York, has filed schedules showing liabilities of $45,925 and nominal assets at $83,952. Among the creditors are the Acme Foundry Co., Cleveland, and the Connecticut Electric Mfg. Co., Bridgeport, Conn.

A special meeting of the directors of the General Motors Corporation, held at Wilmington, Del., Dec. 10, has resulted in approval of an issue of $150,000,000 debenture stock and a reduction of the authorized preferred stock from $100,000,000 to $20,000,000.

The Sharpsville Boiler Works, Sharpsville, Pa., has filed notice with the Pennsylvania State Department of an increase in capital stock from $50,000 to $10,000.

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Tin,	Lead		Spelter	
Dec.	Lake	Electro-lytic	New York	New York	St. Louis	New York	St. Louis
18	26.00	26.00	72.00	6.75	6.45	8.50	8.15
19	26.00	26.00	72.00	6.75	6.45	8.45	8.10
20	26.00	26.00	72.00	6.75	6.45	8.45	8.10
21	26.00	26.00	....	6.75	6.45	8.45	8.10
23	26.00	26.00	72.00	6.50	6.20	8.40	8.05
24	26.00	26.00	72.00	6.50	6.20	8.40	8.05

NEW YORK, Dec. 24.

There will be no controlled markets after Jan. 1 unless it is that of tin. All restrictions on copper are officially announced as removed after Jan. 1. The tin market continues dull with fundamental conditions unchanged. Lead is again an open market from Dec. 21 on. The spelter market continues lifeless and nominal. Antimony is unchanged.

New York

Copper.—Two events the past week have somewhat cleared the atmosphere. At a meeting in Washington on Dec. 20 the War Industries Board notified the Copper Producers' Committee that the market would be free from Government regulation after Jan. 1. Earlier in the week official announcement was made of the formation of an export company to control copper export business. It is to be known as the Copper Export Association. It is composed of representatives of the leading producers and will have to do with the sale of about 50 per cent of the output of those companies. The market continues absolutely inactive. We continue to quote 26c. per lb. as the nominal market price for Lake and electrolytic copper, though small resale lots are heard of as offered at 23c. for electrolytic. Any sales by producers, however, could only be made at 26c. per lb.

Tin.—The market continues dull and featureless. It is understood that orders for tin allocated to the United States Steel Products Co. are coming in very slowly to that company. The indications are that the present control of the market will continue indefinitely if imports of Bolivian ores are allowed to continue to come in unrestrictedly, for this means that American smelters can produce sufficient tin at a price in competition with the fixed price to prolong the consumption of the allocated tin. A solution of the whole complex tin problem which meets with favor is that the Government assume whatever loss there may be in the tin already in the hands of the United States Steel Products Co. and turn the market back into its original free channels. Arrivals at Pacific ports have been 1600 tons thus far this month with 80 tons at Atlantic ports. The London and world markets on tin are entirely open.

Lead.—Last Saturday the Lead Producers' Committee announced that "effective Dec. 21 this committee ceased to be the exclusive selling agency for producers who are now free to quote indiscriminately. There are no restrictions on resales." The market is therefore an open one and earlier than expected. On Monday, Dec. 23, came the announcement of the American Smelting & Refining Co. of a price of lead of 6.50c., New York, thus bringing back the old conditions of a "Trust" price and an outside market. We therefore quote the market as nominal at 6.50c., New York, or 6.20c., St. Louis, with buyers scarce. It is the opinion that the lead market will strike its normal conditions and level sooner than any other so excellently has the situation been managed during the war. This may be true inside of two weeks.

Spelter.—The market is devoid of demand of any proportion. Following considerable buying early in December it has quieted down. Large producers seem fairly well booked but some of the smaller ones are offering first quarter at concessions. The quotation for prime Western is hard to gage but is largely nominal at about 8.05c., St. Louis, or 8.40c., New York, for early delivery. The fact that the weekly reports of the Geological Survey are showing an increase in production in the face of an inactive market is not regarded as an encouraging factor.

Antimony.—The market continues dull and quiet with prompt and January wholesale lots quoted at about 8c. per lb., New York, duty paid.

Aluminum.—It is understood that the maximum prices for No. 1 virgin aluminum and for scrap will continue in force until March 1, the original date set. These prices are 33c. per lb. for 50-ton lots, 33.10c. per lb. for 15 to 50-ton lots and 33.20c. per lb. for 1 to 15 ton lots.

Old Metals.—Consumers are still refraining from buying and as a result prices have declined. Dealers' selling prices are nominally as follows:

	Cents Per Lb.
Copper, heavy and crucible	23.00
Copper, heavy and wire	21.50
Copper, light and bottoms	18.00
Brass, heavy	14.00
Brass, light	10.50
Heavy machine composition	20.50
No. 1 yellow rod brass turnings	11.00
No. 1 red brass or composition turnings	17.50
Lead, heavy	5.75
Lead, tea	4.75
Zinc	5.75

Chicago

DEC. 24.—The market is quiet. Copper for current demand brings the full maximum price; futures are being sold subject to agreement. Tin is steady. Lead has been reduced 55c. per 100 lb. at St. Louis. All restrictions are off and futures are lower. The spelter and antimony markets are slow. We quote copper at 26c. for carloads and 27.30c. for part carloads; tin, 75c. to 77c.; lead, nominal at 6.40c. in carloads, 6.90c. per lb. for 1 to 25 tons and 7.15c. per lb. for less than 1 ton; spelter, 8.25c. to 8.37½c.; antimony, 9.50c. to 10c. On old metals we quote copper wire, crucible shapes, 15.50c.; copper clips, 15c.; copper bottoms, 14c.; red brass, 15c.; yellow brass, 10c.; lead pipe, 4.50c.; zinc, 4.50c.; pewter, No. 1, 30c.; tinfoil, 35c., and block tin, 45c.

In connection with the appointment of receivers for the Fulton Steel Corporation, Fulton, N. Y., Ernest V. Smith, Boston, Mass., holder of receiver certificates of the company to the amount of $50,000, has submitted a plan to Federal Judge George W. Ray for the organization of a new corporation to supplant the present company. It is proposed to organize the new company with an active capital of $200,000, arranging for a series of notes due periodically for present creditors. William Nottingham and Charles V. Byrne, Syracuse, and Edward Quirk are the receivers.

Mrs. Adelbert Fisher, wife of the interned managing director of the Schutte & Koerting Co., Philadelphia, manufacturer of ejectors, valves, etc., stopped the proposed sale of the property at auction, Dec. 14, by securing a court injunction against the action. It is said that this is the first test of the right of the Government to take over and sell German-owned property in this country. The concern is said to be entirely under German control, and was taken over by A. Mitchell Palmer, alien property custodian, some time ago and an American directorate appointed for operation.

The Newport Hydro-Carbon Co., Milwaukee, a unit of the Ferdinand Schlesinger group of iron, steel, coke and chemical industries, on Dec. 14 permanently closed its plant at Carrollville, Milwaukee County. The company has completed its Government contracts.

The Quaker City Supply Co., Philadelphia, has changed its name to the Quaker City Corporation, and will continue as manufacturer, exporter and importer, along broader lines than heretofore.

Prices Finished Iron and Steel, f.o.b. Pittsburgh

Freight rates from Pittsburgh on finished iron and steel products, including wrought iron and steel pipe, with revisions effective Nov. 1, 1918, in carloads, to points named, per 100 lb., are as follows: New York, 27c.; Philadelphia, 24.5c.; Boston, 30c.; Buffalo, 17c.; Cleveland, 17c.; Cincinnati, 23c.; Indianapolis, 25c.; Chicago, 27c.; St. Louis, 34c.; Kansas City, 59c.; St. Paul, 49½c.; Denver, 99c.; Omaha, 59c.; minimum carload, 36,000 lb. to four last named points; New Orleans, 38.5c.; Birmingham, 57.5c.; Pacific Coast, $1.25; minimum carload, 80,000 lb. To the Pacific Coast the rate on steel bars and structural steel is $1.315, minimum carload 40,000 lb.; and $1.25, minimum carload 50,000 lb. On wrought iron and steel pipe the rate from Pittsburgh to Kansas City is 50c. per 100 lb., minimum carload 46,000 lb.; to Omaha, 50c., minimum carload 46,000 lb.; to St. Paul and Minneapolis, 49.5c., minimum carload 46,000 lb.; Denver, 99c., minimum carload 46,000 lb. A 3 per cent transportation tax applies. On iron and steel items not noted above, rates vary somewhat and are given in detail in the regular railroad tariffs.

Structural Material

I beams, 3 to 15 in.; channels, 3 to 15 in. angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, structural sizes, 2.80c.

Wire Products

Wire nails, $3.50 base per keg; galvanized, 1 in. and longer, including large-head barb roofing nails taking an advance over this price of $2, and shorter than 1 in., $2.50. Bright basic wire, $3.35 per 100 lb.; annealed fence wire, Nos. 8 to 9, $3.25; galvanized wire, $3.95; galvanized barb wire and fence staples, $4.35; painted barbed wire, $3.65; polished fence staples, $3.65; cement-coated nails, $3.40 base; these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven-wire fencing are 47 per cent off list for carload lots, 46 per cent for 1000-rod lots, and 45 per cent off for small lots, f.o.b. Pittsburgh.

Bolts, Nuts and Rivets

Large structural and ship rivets.....$4.40 base
Large boiler rivets.....$4.50
⅞ in. x 6 in. smaller and shorter rivets.. 50-10 per cent off list
Machine bolts h.p. nuts, ⅜ in. x 4 in.:
Smaller and shorter, rolled threads....50-10-5 per cent off list
Cut threads.....50-5 per cent off list
Larger and longer sizes.....40-10 per cent off list
Machine bolts, c.p.c. and t. nuts, ⅜ in. x 4 in.:
Smaller and shorter.....40-10 per cent off list
Larger and longer.....35-5 per cent off list
Carriage bolts, ⅜ x 6 in.:
Smaller and shorter, rolled threads.....50-5 per cent off list
Cut threads.....40-10-5 per cent off list
Larger and longer sizes.....40 per cent off list
Lag bolts.....50-10 per cent off list
Plow bolts, Nos. 1, 2, 3.....50 per cent off list
Hot pressed nuts, sq., blank.....2.50c. per lb. off list
Hot pressed nuts, hex., blank.....2.30c. per lb. off list
Hot pressed nuts, sq., tapped.....2.30c. per lb. off list
Hot pressed nuts, hex., tapped.....2.10c. per lb. off list
C.p.c. and t. sq. and hex. nuts, blank....2.25c. per lb. off list
C.p.c. and t. sq. and hex. nuts, tapped....2.00c. per lb. off list
Semi-finished hex. nuts:
⅝ in. and larger.....60-10-10 per cent off list
9/16 in. and smaller.....70-5 per cent off list
Stove bolts.....70-10 per cent off list
Stove bolts.....2½ per cent extra for bulk
Tire bolts.....50-10-5 per cent off list

The above discounts are from present lists now in effect. All prices carry standard extras.

Wire Rods

No. 5 common basic or Bessemer rods to domestic consumers, $57; chain rods, $65; screw, rivet and bolt rods and other rods of that character, $65. Prices on high carbon rods are irregular. They range from $70 to $80, depending on carbons.

Railroad Spikes and Track Bolts

Railroad spikes 9/16 in. x 4½ in. and heavier, per 100 lb., $3.70, in lots of 200 kegs of 200 lb. each, or more; track bolts, $4.90. Boat spikes, $5.05 per 100 lb., f.o.b. Pittsburgh.

Terne Plate

For delivery after Jan. 1, 1919, prices of terne plate are as follows: 8-lb. coating, 200 lb., $14.50 per package; 8-lb. coating, I. C., $14.80; 12-lb. coating, I. C., $16.50; 15-lb. coating, I. C., $17.50; 20-lb. coating, I. C., $18.75; 25-lb. coating, I. C., $20.00; 30-lb. coating, I. C., $21.00; 35-lb. coating, I. C., $22.00; 40-lb. coating, I. C., $23.00 per package, all f.o.b. Pittsburgh, freight added to point of delivery.

Iron and Steel Bars

Steel bars at 2.70c. from mill. Refined iron bars, 5.00c.; common iron bars, 3.50c. in carload and larger lots, f.o.b. mill.

Wrought Pipe

The following discounts are to jobbers for carload lots on the Pittsburgh basing card for delivery after Jan. 1:

Butt Weld

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	47	20½	⅛ and ¼	26	+1
½	51	36½	⅜	27	List
¾ to 3	54	40½	½	31	13
			¾ to 1½	36	20

Lap Weld

2	47	34½	1¼	21	6
2½ to 6	50	37½	1½	28	14
7 to 12	47	33½	2	29	15
13 and 14	37½	..	2½ to 6	31	18
15	35	..	7 to 12	28	15

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	43	25½	⅛, ¼ and ⅜	25	8
½	48	35½	½	30	17
¾ to 1½	52	39½	¾ to 1½	36	21
2 to 3	53	40½			

Lap Weld, extra strong, plain ends

2	45	33½	1¼	22	7
2½ to 4	48	36½	1½	28	14
4½ to 6	47	35	2	30	17
7 to 8	43	29½	2½ to 4	32	20
9 to 12	38	24½	4½ to 6	31	19
			7 to 8	23	11
			9 to 12	18	6

To the large jobbing trade an additional 5 per cent is allowed over the above discounts, which are subject to the usual variations in weight of 5 per cent.

On butt and lap weld sizes of black iron pipe, discounts for less than carload lots to jobbers have been seven (7) points lower (higher price) than carload lots, and on butt and lap weld galvanized iron pipe have been nine (9) points lower (higher price).

Boiler Tubes

The following are the prices for carload lots, f.o.b. Pittsburgh, for delivery after Jan. 1:

Lap Welded Steel		*Charcoal Iron*	
2½ to 4½ in.	37	2½ to 4½ in.	15½
2½ to 3¼ in.	27	3 to 3¼ in.	+ 2
2¼ in.	20½	2½ to 2¾ in.	+ 4½
1¾ to 2 in.	16	2 to 2¼ in.	+19½
		1¾ to 1⅞ in.	+32

Standard Commercial Seamless—Cold Drawn or Hot Rolled

Per Net Ton		Per Net Ton	
1 in.	$334	1¾ in.	$214
1¼ in.	271	2 to 2½ in.	184
1⅜ in.	264	2⅝ to 3⅜ in.	174
1½ in.	214	4 in.	194
		4½ to 5 in.	214

These prices do not apply to special specifications for locomotive tubes nor to special specifications for tubes for the Navy Department, which will be subject to special negotiation.

Sheets

Makers' price for mill shipments on sheets of United States standard gage in carload and larger lots are as follows:

	Cents per lb.
Blue Annealed—Bessemer	
No. 8 and heavier	3.85
Nos. 9 and 10 (base)	3.90
Nos. 11 and 12	3.95
Nos. 13 and 14	4.00
Nos. 15 and 16	4.10
Box Annealed, One Pass Cold Rolled—Bessemer	
Nos. 17 to 21	4.50
Nos. 22 and 24	4.55
Nos. 25 and 26	4.60
No. 27	4.65
No. 28 (base)	4.70
No. 29	4.80
No. 30	4.90
Galvanized Black Sheet Gage—Bessemer	
Nos. 10 and 11	5.05
Nos. 12 and 14	5.15
Nos. 15 and 16	5.30
Nos. 17 to 21	5.45
Nos. 22 and 24	5.60
Nos. 25 and 26	5.75
No. 27	5.90
No. 28 (base)	6.05
No. 29	6.30
No. 30	6.55
Tin-Mill Black Plate—Bessemer	
Nos. 15 and 16	4.50
Nos. 17 to 21	4.55
Nos. 22 to 24	4.60
Nos. 25 and 27	4.65
No. 28 (base)	4.70
No. 29	4.75
No. 30	4.75
Nos. 30½ and 31	4.80

PERSONAL

Lieut. Col. Louis J. Campbell, vice-president Youngstown Sheet & Tube Co., is safe in France, his relatives have been informed. At the time of the signing of the armistice he was fighting near the Argonne Forest, where the Americans lost heavily. He has gone to the south of France and will not be with the army of occupation.

L. H. G. Bouscaren, for the past three years district manager of the Stone & Webster Corporation at Youngstown, Ohio, leaves Jan. 5 for France with other representatives of the company to study industrial conditions. He will be succeeded by George E. Chamberlain, general superintendent in charge of construction, who has been with the corporation nine years.

N. L. Snow, formerly vice-president and sales manager of the Terry Steam Turbine Co., Hartford, Conn., has been elected vice-president and general manager. He has been connected with the company for the past 10 years.

The Whiting Foundry Equipment Co., Harvey, Ill., announces several changes that have been made in its organization. The following men have left the company: F. A. Rundle, general superintendent; C. A. Hardy, sales manager, and G. R. Brandon and P. A. Dratz, Chicago representatives. Samuel Moore, formerly general manager of the Bond plant of the American Radiator Co., is now general superintendent, and the company will be represented in Chicago by George Ristine, formerly with the Pressed Steel Car Co.; H. A. Wolcott, formerly with the McMyler Interstate Co., and E. V. Brown and Walter R. Hans, members of the company's engineering staff.

L. E. Townsley, manager of the foreign trade department of Paul R. Ruben & Co., 16 California Street, San Francisco, leaves the last of January for China, Japan, Philippines, Dutch East Indies, Straits Settlements and Australasia, to establish resident agents at principal ports. Correspondence is invited with American manufacturers desiring to increase their foreign trade.

R. S. McLaughlin, Oshawa, Canada, president McLaughlin Motor Car Co., has been elected a director and member of the executive committee of the General Motors Corporation.

A. G. Gullberg, for many years chief engineer of the Calumet & Hecla Mining Co., Calumet, Mich., and lately superintendent of motive power at the Tamarack, will leave shortly for Sweden to engage in the manufacture of motor cars. He will take a leading part in the organization in New York of a company which is to promote the manufacture of both commercial and passenger cars in Scandinavia.

Roy D. Chapin, chairman of the highways transport committee of the Council of National Defense, has tendered his resignation to Secretary of War Baker, to resume the presidency of the Hudson Motor Car Co. He returns to Detroit after a year's service in Washington.

The following appointments have been announced by the Guerber Engineering Co., Bethlhem, Pa., manufacturer of structural shapes and iron and steel products: D. H. Brillhart, heretofore assistant to the general manager of fabrication, to be manager of the department; W. S. Hutchinson, from manager of sales to manager of contract and construction; P. W. Snethen, from a member of the sales department to chief engineer, succeeding John J. Cannon, Jr., deceased.

A testimonial dinner at the Onondaga Hotel, Syracuse, N. Y., was tendered Dec. 14 to Thomas W. Meacham, retiring president of the New Process Gear Corporation, by about 100 employees at the works. Mr. Meacham recently sold his interest in the company.

A testimonial dinner was tendered to Harry A. Bachman, retiring factory manager of the Long Island City plant of the Wright-Martin Aircraft Corporation, at Hotel Ansonia, New York, Dec. 14. He was formerly vice-president and general manager of the Edison Storage Battery Co. and Thomas A. Edison, Inc., West Orange, N. J., and resigned to become associated with the Wright-Martin company during the period of the war.

H. A. Wilder has been appointed purchasing agent of the Heppenstall Forge & Knife Co., Pittsburgh.

The Philadelphia *Inquirer* of Dec. 19 gives a number of portraits of local men to whom birthday felicitations are extended. Among them is Emmett B. Carter, engineer with the Midvale Steel & Ordnance Co., graduate of Cornell, class of 1899.

A. O. Backert, president American Foundrymen's Association, was the honor guest of the Pittsburgh Foundrymen's Association at a dinner and entertainment given at the Pittsburgh Athletic Association, Pittsburgh, the evening of Dec. 16.

Clarence H. Howard, president Commonwealth Steel Co., has been appointed by Mayor Henry W. Kiel of St. Louis on the Municipal Reconstruction Committee which will act in an advisory capacity to the municipal administration in the solution of after-the-war problems.

George E. Cullinan, St. Louis, Western district manager for the Western Electric Co. since 1916, has been appointed manager of the Central district, with headquarters at Chicago, to have charge of the company's business in 12 States. H. N. Goddell, formerly manager of the Omaha branch of the company, succeeds Mr. Cullinan as Western district manager at St. Louis.

F. L. Hinman has been appointed mechanical engineer of the Sheffield Co., Sheffield, Ala. This company, which is under the management of the J. G. White Management Corporation, New York, furnishes street railway transportation, electric light and power and water service in Sheffield, Tuscumbia and Florence, Ala.

E. A. Muller, general manager King Machine Tool Co., Cincinnati, has been elected president of the Engineers Club of Cincinnati.

George E. Day, a director of the Youngstown Sheet & Tube Co., formerly general sales manager, has relinquished his duties as director of the Bureau of Oil Well Supplies at New York, and has gone to California to spend the winter. He had charge of the allocation of iron, steel and other materials to manufacturers of oil country goods.

H. W. Clarke, who until Dec. 15 had been connected with the advertising service department of the McGraw-Hill Co. at Chicago, has been appointed manager of advertising for the Chicago Pneumatic Tool Co., Chicago. Prior to his connection with the McGraw-Hill publications he spent eight years with the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., part of the time as a member of the sales and publicity departments and later as Western publicity representative with headquarters at Chicago.

Anaconda's Tall Chimney

Advices from Anaconda, Mont., state that Dec. 14 the last brick was laid by the Anaconda Copper Mining Co. on what is claimed to be the tallest smokestack in the world. The stack was built for the Washoe smelter and was finished after a little more than six months of work uninterrupted by any accident or labor trouble.

The new stack is 585 ft. 1½ in. high. Its base of reinforced concrete is 86 ft. outside diameter and 75.4 ft. inside. At the top the inside diameter is 60 ft. It weighs about 34,000 tons and is built of brick manufactured at the Anaconda company's local plant. The stack contains 6,672,214 bricks and 68,845 sacks of cement. In comparison with this monster stack, the Tacoma smelter stack is 572 ft. 10½ in. high; one in Japan 570 ft. and that at Great Falls, Mont., 510 ft.

The Vermilion Malleable Iron Co., Hoopeston, Ill., last week paid bonuses amounting to $10,000, each man receiving 10 per cent of his salary.

OBITUARY

JOHN JARRETT, former president Amalgamated Association of Iron, Steel and Tin Workers, died last week at the home of his son in Pittsburgh, aged 76 years. He was born in Wales, came to this country when 14 years old and became a practical rolling-mill worker. In 1877 he was elected president of the association named and remained at its head until 1883. In that year manufacturers in Pittsburgh organized the American Tin Plate Association and Mr. Jarrett was placed in charge. The purpose of the organization was to obtain a tariff on tinplate to protect the American industry, which was done by the enactment of the McKinley tariff. Mr. Jarrett was afterward appointed consul to Birmingham, England, and spent three years there, making a special study of the manufacture of tinplate in England and Wales. When he returned to this country he was placed at the head of an organization of tinplate and sheet steel manufacturers and remained in that capacity until the formation of the United States Steel Corporation.

Brief reference was made in THE IRON AGE of Dec. 19 to the death of Joseph W. Morrison, eldest son of John R. Morrison, secretary and manager Delaware Seamless Tube Co., Auburn, Pa. Mr. Morrison's death was due to shell wounds received in the battle of the Argonne. His father has received a letter from Lieut. C. T. Cole, who says: "He was every inch a true man and a true soldier. Though being away from home, he lived up to his former teachings as his parents would wish him to." Lieut. Cole then tells how at various times "Joe" was selected for the most dangerous posts and always did his duty with the greatest courage, and was recommended for a French War Cross. After being struck by a shell, he was taken to the operating hospital. Lieut. Cole found him resting comfortably after the operation, and the surgeon assured him that the wounded man had a fighting chance. "The next day," says Lieut. Cole, "I was unable to make a trip to the hospital as our men had advanced some 15 kilometers, and when I did get word our 'Joe' had gone where all brave and fearless soldiers must go some day. The section was, from myself on down, a downhearted lot, and I can tell you that it was hard for every one of us to go ahead and do our duty."

HARVEY W. FORD, Detroit, organizer of the Saxon Motor Co. and later its president, died Dec. 18 in St. Luke's Hospital, New York, from pneumonia, aged 36 years. He was recently discharged from the motor transport corps, in which he served as captain.

JOSEPH BAKER, JR., vice-president Baker Stove Works, Belleville, Ill., died from influenza last week at Washington, where he was connected with the aerial traffic department of the War Department. He was 27 years old.

JOHN F. RENO, chief engineer Root & Van Dervoort Engineering Co., East Moline, Ill., died Dec. 19, from influenza followed by pneumonia. He had been with the company, about 12 years and was in the prime of life when fatally stricken.

J. MARION CREAMER, vice-president American Propeller & Mfg. Co., Baltimore, died Dec. 15 from pneumonia following influenza, aged 30 years. He leaves his widow and two children.

HOMER O. PAGE, Adrian, Mich., a director of the Page Steel & Wire Co. and manager of its specialty department, died Dec. 7.

LEANDER SETH WOODBURY, Great Falls, Mont., president and founder of the Great Falls Iron Works, died Nov. 22.

J. W. HENDERSON, chief of the bureau of smoke regulation of the Department of Health, Pittsburgh, died Dec. 19, from pneumonia, aged 50 years. He did excellent service in attempting to abate the smoke evil, taking up that work in 1914. Before that he had been connected with the Standard Car Co. and the Pressed Steel Car Co. and had been vice-president of the Gulick-Henderson Laboratories.

Labor Troubles

About 23,000 employees of the General Electric Co.'s works at Schenectady, N. Y., declared a sympathetic strike Dec. 19, with co-workers at the Erie, Pa., plant. Employees at the Lynn and Pittsfield, Mass., as well as Fort Wayne, Ind., works, have also walked out on strike, making a total number of about 60,000 men, and necessitating the closing of a number of departments. The strike at the Erie works, the forerunner of the trouble, was caused on the ground that the company refused to recognize the union at the local plant, and to reinstate 10 men who were discharged, the latter action being held necessary by the company owing to the cancellation of war contracts. The controversy at the Erie works began early in December.

Riveters and bolters-up at the shipyard of the Pusey & Jones Co., Gloucester City, N. J., declared a strike Dec. 16, on account of a new wage scale. The men hold that they are earning from $3 to $5 less a week than under the former 8-hr. schedule. On the day following the men were joined by the reamers at the yard and by riveters from the adjoining Pennsylvania yard of the company, while on the succeeding day the drillers, chippers and calkers at both yards walked out, making a total of about 1500 men on strike.

A closed shop, with 48-hr. working week and wage increase aggregating $5 a week, has been granted employees of the Gem Metal Products Corporation, 190 Hinsdale Avenue, Brooklyn, N. Y.

The boiler makers of the Alameda, Cal., plant of the Bethlehem Shipbuilding Corporation, who have been on strike the past four weeks to enforce the recognition of the 44-hr. week, have returned to work on what they now claim were false representations, and are threatening to strike again. None of the shops, except those connected with the shipyards, where the Government has agreed to reimburse them, will agree to pay the retroactive scale granted the men. In addition, the Pacific Coast Metal Trades Council has voted to call a general strike on the entire coast if a decision is not soon given by the Board of Review and Appeal at Philadelphia. This, if successfully inaugurated, would tie up the entire metal trade of the Pacific Coast. Illustrating the uneasiness of the men, it may be stated that two small strikes, one by the employees of the Mann Mfg. Co. and the other the George Anderson Co., both at San Francisco, have just been inaugurated. About 50 men struck in the two shops, contrary to agreements not to take such action without conference. If these strikes and threats of strikes can be adjusted, all agree that all lines of business on the Pacific Coast will open up lively within the next month or two. The outlook for export of machinery from San Francisco seems excellent, judging from inquiry coming from the Orient and also from Australia and New Zealand.

The union molders in Cleveland, employed both in light and heavy foundries, have demanded a new wage scale, effective Jan. 1, of $6.50 per day for an 8-hr. day. The regular scale the past year has been $5.50 with a 9-hr. base day. However, it is claimed that molders generally have been earning $6 and higher per day, many shops running overtime and others paying high piece rates. The foundries generally strongly object to reducing the base day from 9 to 8 hr., but may possibly be willing to compromise on the demand for a wage increase.

The Brown-Bevis Co., Los Angeles, Cal., has been incorporated with a capital of $25,000 to take over the business of D. G. Bevis & Co., machinery merchants. The company will locate a works in the machinery and equipment section of the city, including the operation of three yards. It is proposed to broaden and extend the present lines to include the export to Australia and the Orient of industrial machinery of various kinds, contractors' machinery and other equipment. Daniel R. Brown is president; D. G. Bevis, vice-president and manager, and Robert E. Abbott, secretary.

Labor Problems Are Worrying Washington

Finding Employment for Returning Soldiers and Discharged War Workers Beset with Difficulties—Rapid Demobilization of War Industries Board

WASHINGTON, Dec. 23.—Labor problems are giving Washington officialdom an increasing amount of trouble. Although demobilization of the cantonments has been progressing less rapidly than was originally expected, reports have already come from various States that the employment service has not been able to care for all the men discharged. Far more serious, however, is the question of finding new work for discharged war workers, and the Department of Labor is trying to induce the War Department to go more slowly on cancellations as well as on the demobilization.

The War Department has already held back millions of dollars' worth of cancellations because of fear of glutting the labor markets, although these delays have cost the taxpayers heavily, but the situation is gradually getting beyond their control, and the cancellations probably will continue until all work has been stopped on purely war contracts. Nor has there been much sympathy in high Army circles for the efforts which the Department of Labor is making to induce the Government to keep a million or so of soldiers in the cantonments over the winter months rather than give them their discharges so that they will be competitors in the labor markets.

Labor Troubles Getting Harder to Settle

Behind it all, however, there is a growing spirit of unrest verging on Bolshevism which is worrying the Labor Department officials in Washington. The surprising brittleness of the situation was best revealed in the General Electric Co. strike, in which 30,000 men had left their positions before the Labor Department was aware that real trouble was at hand. Another feature of this situation lies in the fact that the National War Labor Board which was used during the war to straighten out difficulties of this kind is now impotent. Its record of decisions during the war was such that it is now practically impossible to secure agreements for submission of strikes to that body, and without such an agreement in advance the Board would have neither influence nor power to enforce its views.

This is true of the whole machinery of the Department of Labor. Having done little during the war to inspire confidence in its impartiality or in its ability to judge a situation fairly and openly on all its merits, the Department of Labor now finds itself handicapped by a lack of sympathy and support in great circles where only such influence can be of value.

The Department officials admit that their position is now a difficult one. For some time they have been talking optimistically about the labor situation, and have lent apparent sanction to the announcements of labor union representatives that wages would remain at their war highwater marks. They have also talked publicly about the ease with which the industries of the country would be able to absorb both the returning soldiers and the discharged war workers. So far their statistics have even borne out this promise. But now it develops that this was largely true because the statistics were compiled before the real effect of the cessation of hostilities had made itself felt. Now that the unemployment of war workers and ex-soldiers is growing more rapidly, the officials find that they have overestimated the absorbing power of the peace industries.

The chief fear is that this will increase during the winter months, and so far there has been nothing in the prospect of peace industries to indicate that a real boom is coming which will make it possible for these to employ great armies of men, especially at the emergency war wages which prevailed during the summer. With this has come a growing spirit of unrest and discontent which has been reflected in reports of labor troubles from various parts of the country, and against which so far there has been no actual countercampaign.

The National War Labor Board is still at work on decisions in cases which came to it before the actual signing of the armistice, although its ability to enforce its decisions expired with the cessation of fighting.

Among the notable decisions is one by Judge Julian W. Mack of Chicago as umpire in the case of the Iron Molders' Union of Elizabeth, N. J., against the Iron Foundry Owners in that city. The decision was in favor of the employees. According to Judge Mack's decision, the employers and employees had an agreement made in January, 1918, effective until July 1, 1918, fixing the wages of molders and coremakers at $4.75 per day of nine hours. On May 31 the business agent of the union sent to the employers a demand for 72½c. an hour on an 8-hr. day basis, with one and one-half times the hourly rate for overtime and double the hourly rate for Sundays and legal holidays. Pending the settlement of the controversy by the War Labor Board, a *modus vivendi* was agreed upon by the employers and the workers on a basis of $5.75 for a 9-hr. day. Judge Mack has ruled that the workers are right, and that they should receive $5.75 for an 8-hr. day, with $1.08 for ordinary overtime and $1.44 per hour for overtime on Sundays and holidays. The award, however, is effective only from Dec. 7 to Dec. 31, because the agreement specifically provided that it should not be retroactive and that it should not go further than the end of the year.

The Department of Labor has announced a nation-wide investigation into the hazards of industry, to be conducted by its Working Conditions Service. The inquiry is to be made into all conditions affecting the health and efficiency of workers, particularly into occupational diseases.

The United States Employment Service and the Bureau of Labor Statistics have issued a pamphlet defining the various occupations in the Metal Working, Building and General Construction, Railroad Transportation and Shipbuilding Industries. The purpose of the pamphlet is to give uniformity to the generally used terms of vocational and occupational positions. It is specifically provided, however, that these definitions are not to be taken as official on the part of the Government in the determination of contracts. O. F. S.

Winding Up Work of War Industries Board

WASHINGTON, Dec. 24.—All energies of the War Industries Board are now being devoted to the demobilization of that body and to the revocation of the remnants of orders and regulations which it issued during the past year. Most of the personnel of the Board has disappeared from Washington. The members who are left are straightening out their files and writing up their reports. But the Board's work is over.

The functions of the Board will expire Dec. 31 as a matter of actual operation. Technically the existence of the Board is far more indefinite. Its most important operation, that of price fixing, ends with the year.

All price fixing has been abandoned, despite efforts on the part of the various industries—such as the copper industry—to induce the Board to continue prices to prevent an undue slump in the copper market. But it was just as unsuccessful as the effort on the part of the steel industry two weeks ago to induce the Board to get under the sagging steel price situation. In

the copper industry, the interests involved had the support of the War Labor Policies Board and the Department of Labor. This was directly traceable to the fact that all the copper refineries have wage schedules based on the price of copper and there was an apparent fear among Washington Labor Department authorities that the I. W. W. unrest in the copper mining sections would respond quickly to a decrease in wages. The argument, however, had no effect and the Price Fixing Committee of the Board refused to have anything to do with the further fixing of prices.

Just as important as the abandonment of the price-fixing policy was the formal announcement of Chairman Baruch that all priority restrictions and directions not previously revoked by the War Industries Board have been lifted, effective Jan. 1, 1919. The formal announcement of this revocation was issued by the Priorities Division as circular No. 60. Its text follows:

REVOCATION OF RESTRICTIONS

TO ALL CONCERNED:

Effective Jan. 1, 1919, all the rules, regulations and directions of every nature whatsoever issued by the Priorities Division of the War Industries Board, are hereby canceled, and all pledges heretofore made on the suggestion or request of the said Priorities Division are hereby revoked.

EDWIN B. PARKER,
Priorities Commissioner.

Approved, B. M. BARUCH,
Chairman, War Industries Board.
Washington, Dec. 20, 1918.

Will Go to Europe

Announcement has been made through the State Department that President Wilson has sent for Chairman Baruch of the War Industries Board and Chairman Vance McCormick of the War Trade Board to assist in working out the ecenomic problems of peace at Paris. Some time ago it was announced that Mr. Baruch had been asked to hold himself in readiness for this purpose and he has been preparing to follow the President to Europe. With him will go J. Leonard Replogle, the Director of Steel Supply of the War Industries Board. Both of them have been devoting serious attention to the export features of American industries and are prepared to participate in the Paris conferences with first-hand data concerning the part which the United States is to play in the economic readjustment of the world.

The demobilization of the War Industries Board has thrown the chief burdens of reconstruction problems upon the War Department, the War Trade Board and the Department of Labor. The Department of Commerce has neither power nor machinery to meet any of the problems with which American industry is now confronted. Even in the matter of export markets the Department of Commerce can furnish only statistics.

Chairman Baruch and the other members of the War Industries Board optimistically insist that all the problems of reconstruction have already been worked out and that there is no longer any particular peril for American industry as a whole.

Secretary Crowell's New Duties

Benedict Crowell, assistant secretary of war and director of munitions, has been requested by the President to assume responsibility for the proper disposition of all property acquired by the War Department since April 6, 1917.

Mr. Crowell has appointed C. W. Hare, assistant director of munitions, to have general supervision of this work, and Brig. Gen. C. C. Jamieson has been appointed director of sales, in direct charge of an organization to be perfected for the disposal of surplus property.

Policy and procedure upon which sales will be made will be formulated by the director of munitions, the assistant director of munitions and the director of sales. It is the intention of the director of munitions to so market Government property as to interfere as little as possible with business conditions, and to this end the assistant director of sales will, as occasion may require, confer with committees representing the industries affected.

O. F. S.

Relief for Manganese Ore Producers

WASHINGTON, Dec. 24.—Efforts to secure legislative relief are being made by the manganese and chrome ore producers of the country who responded to the appeal of the War Industries Board to increase the domestic output of rare minerals to meet the war emergency. Now that they have piled up stocks of high-priced ores the cessation of hostilities has left them holding the bag, and so far no official body has been able to come to their relief.

Men connected with these industries say it will require about $4,000,000 to reimburse them for the outlays which they made. There is some discussion of attempting to secure legislation which would protect these newly developed industries against foreign competition and thus add them permanently to our lists of industries. That feature, however, seems to find less support than the proposal that they be reimbursed for their losses.

In the latter request they have enlisted the support of Secretary Lane of the Interior Department and Director Van H. Manning of the Bureau of Mines. A bill will probably be presented to the Mines and Mining committees of the two houses of Congress for action there. Nothing can be done without Congressional action. A series of conferences was held in Washington last week, under the auspices of the American Mining Congress, in an effort to frame proposals for relief. These were attended by representatives of the Department of the Interior as well as by members of Congress. No members of the War Industries Board, however, took part. The Ferroalloys Section of the War Industries Board has not been officially dissolved, nor has its machinery been turned over to the Bureau of Mines. The representatives of the latter, however, who as well as those detailed by the Geological Survey have returned to their former offices, are doing all in their power to help the mine operators.

It is likely that the proposed legislation will take the form of an amendment to the "War Minerals Act" passed in October by Congress appropriating a revolving fund of $50,000,000 for the stimulation of this production. None of that money is now available for this purpose, and the statute itself did not reach the Bureau of Mines until after the signing of the armistice. It requires Congressional legislation to make any of the $50,000,000 available for the relief of these mine operators.

How the Producers Met War Needs

Under the stress of war needs it was found necessary to divert all vessels which had been previously used for the importation of manganese, chrome, tungsten, tin, pyrites, etc., to the transport overseas of American troops and provisions for the European Allies. Manganese was being imported from Brazil, chrome from New Caledonia, pyrites from Spain and tungsten from China.

To make up for this deficit, producers were told to go ahead and produce these minerals in the United States, and it was intimated that the Government would see that no losses were incurred by the contracting parties.

Now manganese and chrome producers claim that they have a heavy overproduction which can not be disposed of.

"We have followed the Government's instructions," said one producer. "We have gone ahead and spent large sums of money in producing manganese, chrome, pyrites, and other necessary war minerals which were formerly imported, and now with the signing of the armistice the Government will not take over the product and steel producers declare they do not need it. As a result, several of the men engaged in this work as

a patriotic duty have gone bankrupt, while others have tons of valuable mineral on their hands which they cannot sell."

The Secretary of the Interior, to whom under the provision of the War Minerals Act is intrusted the carrying out of its provisions, feels that further Congressional instruction should be given him before executing the powers conferred upon him by the act.

Director Manning of the Bureau of Mines, numerous officials and members of the Senate and House Committees on Mines and Minerals, express themselves as favoring the demands of the producers concerned. It is explained that large sums of money have been expended in carrying out the provisions of the War Minerals Act by many persons throughout the country and that these persons stand to lose their investment which in many cases will mean bankruptcy unless legislative relief is afforded, for the minerals which they were asked to produce are now being delivered to American users at prices much below the cost of the American product.

Producers recommend that the Secretary of the Interior be authorized and directed by Congress to execute the provisions of the War Minerals Act so as "to determine the measure of damage suffered in each case, due consideration being given to the conditions and prices prevailing at the time of investment and the need of the Government which such investment was intended to meet, and to liquidate the same (in cash) at the time that such damage is determined, such damages to be paid out of the appropriation provided by said act."

Adjustment of War Contracts

WASHINGTON, Dec. 24.—Contractors who have been refused payment or adjustment on Government contracts because of the adverse ruling of Comptroller Warwick of the Treasury because of technical difficulties are to be treated as though their contracts—even oral orders—had been legally executed under the terms of the special relief bill finally agreed upon by the House Committee on Military Affairs.

Chairman Dent of the committee secured the promise of the House leaders that the bill would be given the right of way for passage before the holiday vacation. Just what the Senate will do is more difficult to forecast, but it seems certain that it also will accept a measure to grant relief to the contractors who have about $1,000,000,000 tied up by the difficulties which have been created by the carelessness with which statutory requirements were ignored during the war.

The bill upon which the House Military Affairs Committee agreed authorizes "the Secretary of War to adjust, pay, or discharge any agreement, express or implied, upon the basis of reasonable value, but in no case greater than the agreed price, that has been entered into in good faith during the present emergency and prior to Nov. 12, 1918, by any officer or agent acting under his authority, direction, or instruction, with any person, firm, or corporation for the acquisition of lands, or the use thereof, or for any supplies, material, or equipment, to be used in the prosecution of the war, when such agreement has been executed in whole or in part, or expenditures have been made or obligations incurred upon the faith of the same by any such person, firm, or corporation prior to Nov. 12, 1918, and such agreement has not been executed in the manner prescribed by law."

Chiefly outside of Congress there has been some question about giving final power to the Secretary of War without allowing an appeal to the Court of Claims, although it seems likely that in 90 per cent of the cases, according to the testimony given before the committee, it will be merely a matter of bookkeeping to determine the just amount to be paid. One big difficulty, however, will lie in the fact that the solution proposed contemplates no payment for prospective profits on the part of the contractors.

In a letter to Chairman Dent on this subject, G. H. Dorr, assistant director of munitions, says:

"Under all the foregoing classes of cases the contractors have, at the request of the United States and in response to the needs of the war emergency, made expenditures and incurred obligations in preparing, or actually entering upon, the task of supplying the war needs of the country. They have a part, and in many cases an essential part, of their working capital tied up in the expenditures they have made in preparing to begin work, in the creation of facilities, in actual materials purchased, wages paid to labor employed, or in work in process. In order that this working capital may be returned to them so that they may as speedily as possible go into commercial work, it is essential that there be a prompt adjustment under these informal or implied agreements. In this matter time is of the essence. To effect such adjustment under the foregoing classes of cases it is necessary, under the decisions of the comptroller, to secure the remedial legislation now proposed. Contractors who have had formal written contracts should not be penalized for the reason that it now develops that the Chief of the Procurement Division of Ordnance could not deputize his principal assistants to sign a contract. Nor should the patriotism be penalized of those who in the exigencies of the war have gone ahead to produce instead of waiting to bargain. It is true that such persons have nothing to rely on except the good faith of the United States, but surely there should be no more solid ground for reliance than that good faith."

Part of the text of the bill was written by the War Industries Board, which has been trying to secure relief for these contractors and which had insisted, however, that the Government must make allowances for profits in any consideration which is made of readjustment. It is likely that the Senate Military Affairs Committee will hold further hearings when the bill reaches that body.

Manufacturers Take Optimistic View of Conditions

At a meeting of the Committee on Readjustments of the National Association of Manufacturers, held at Hotel Astor, New York, Dec. 17, the committee expresses as its conclusion that the readjustment of industries of the United States does not present to the business interests the insurmountable tasks many injudicious newspaper statements cause the public to think exist. The statement says:

First. It is our opinion there exists a well-defined attempt to create in the minds of the public and of business men of the United States the impression we are to experience in the near future an unheard of cessation of industry. Such an impression, we believe, is not in accordance with the facts.

Second. It is our opinion the factories and stores of the United States are at present almost depleted of their normal stocks and that our country is on the threshold of a most unprecedented business expansion owing to this domestic condition.

Third. We are of the opinion that the developments of export trade will naturally follow the prestige gained by the United States of America in the markets of the world and that it is the duty of all manufacturers to foster and encourage such expansion of export business as may be normally and healthfully developed.

Fourth. We believe it is not a time to become hysterical over the conditions, but, on the contrary, a time for watchful, sober consideration of developments as they arise, to the end that readjustments may come about with as little disturbance as possible.

Fifth. In view of the above, we caution all manufacturers against hasty action or conclusions in reference to employment questions, believing as we do that the normal demands of industry will supply work for all those now employed as well as the thousands of returning soldiers and sailors who will be returned into industry.

Machinery Markets and News of the Works

TRANSITION PROBLEMS

More Ordnance Contracts Canceled

Buyers Looking for Lower Prices, Builders Oppose—No Announcement as to Progress in Plan to Control Tool Surplus

Problems of transition to normal peace-time operations are now fully occupying the attention of both machine-tool builders and dealers. Buyers of equipment are equally absorbed by the abrupt interruption of manufacturing involved in the almost general spread of cancellations. The only buying of scope is for the present confined to automobile makers in the Detroit district. The inquiry of the Burroughs Adding Machine Co., Detroit, for 100 machines is a notable exception.

The Ordnance Department has stopped work at a number of prominent munition plants, which had continued their production under the impression that in the absence of orders to the contrary they would be permitted to run for some time to come. Among these is a large manufacturer of adapters at Kenosha, Wis.; the International Arms & Fuze Co., Bloomfield, N. J., which had fuse contracts running for six months or so, and a number of northern Ohio plants making parts for heavy artillery.

With demand at a minimum purchasing agents are disposed to look for sharp reductions in prices of machine tools; but any such trend is unanimously opposed by the builders. Wages, which constitute the largest factor in the cost of building tools, are being maintained; and it is further emphasized that any approaching drop in prices of materials has no relation to present manufacturing. The value of the metal going into standard-weight machine tools is but a small item of total cost, so that a lower charge for castings, etc., can at most have but little effect on the selling price. The start of any buying movement is generally conceded to be several weeks off at least.

No announcement has been forthcoming as to what progress is being made by the joint committee of the builders and dealers in co-operation with the War Department for the gradual resale of the $300,000,000 surplus of Government machine tools. It crops out that among the dealers those who looked forward to picking up bargains in munition equipment do not regard the plan favorably.

One of the principal considerations in this plan is admittedly the interest of both the Government and the builders in keeping labor employed. Manufacturing of machine tools is expected at best to be on reduced operating schedules, and on this basis alone the co-operative selling of the Government tools is in many quarters considered essential.

It is now stated by Assistant Secretary of State Crowell that the Neville Island ordnance plant will be constructed by year-to-year appropriations.

It is reported that the War Department plans to rebuild cranes purchased for its munition plants, wherever practicable. This may involve considerable reconstruction and in that case would furnish crane makers with a lot of work that will help to sustain plant operations over a possible slack period.

New York

NEW YORK, Dec. 23.

The machine-tool market is locally still in a state of flux. With only the principles of the program for co-operation between the tool builders and the Government as yet formulated for the disposition of the surplus $300,000,000 worth of Government tools, a great deal of caution and conservation naturally predominates the market. Buyers persist in some instances in looking for a quick drop in prices, in keeping with the expected fall in steel costs, but sellers resist any such tendency. The cost of a machine tool, it is pointed out by them, is largely a charge for labor, the part that covers the cost of the metal being comparatively trivial in standard sized tools. If there is such a thing as an ultimate minimum, buying has about reached it. Beyond a few inquiries for tools, some of which result in placing orders, dealers are devoting the energy of their sales staffs to missionary work, intent on keeping a constant watch on the pulse of the market. No one in the trade, however, expects to do any business before the first of the year. It may not be improbable that the magic of the new year lends its glamor somewhat to pictures of a renascent buying movement soon to follow. Certain it is that experienced salesmen, in close touch with customers, place the revival of buying five or six weeks away. It is generally recognized that the armistice period has been too short to enable many companies to formulate peace-time plans and properly gage machine-tool requirements. The so-called starved peace industries and manufacturers developing new inventions and ideas are expected to be first in the market.

A market phase for the moment seems to be the spreading of rumors founded on the supposed closing down of munition plants. While such actions are to be expected at this time, two characteristic examples with their concomitant wraith of uncertainty in the background, may be cited. The Wright-Martin Aircraft Corporation was reported to have closed down; as a matter of fact, operations were suspended three days, Dec. 16-18, for inventory, and work was then resumed full blast Dec. 19. Even should its Government airplane contracts be terminated, the company is reliably reported to have other work to take up a good part of any resultant slack in manufacturing. The International Arms & Fuse Co., Bloomfield, N. J., was reported to have had its munition contracts canceled. Actually this is correct, the Government having directed work on them to cease Dec. 24. This order left considerable work undone, as the shell contract ran to Jan. 1, that for hand grenades until March 1, that for fuses until June 1. It is understood that 1000 hands were laid off last week and that about 3000 more will follow this week; but it should be noted that about 10,000 constitute the total working forces, and that the implication that the company will close up shop is without foundation in fact. These rumors anticipate dumping of equipment; but so far there is nothing worth talking about of this kind. What may prove more likely among munition makers is the reported action of the General Electric Co., to equip its new lamp-making machinery building plant, the Electrical Appliance Mfg. Corporation, Newark, N. J., with surplus munition equipment from its plants at Schenectady and Erie.

Activity in crane buying is also limited. The Cumberland Valley Railroad, W. S. Galloway, Baltimore, purchasing agent, is in the market for 1 15-ton crane and 1 150-ton crane of about 75-ft. span for Chambersburg, Pa. The Philadelphia & Reading Railroad will not purchase the proposed 250-ton crane for its shop at Reading, Pa., substituting instead plans for a hydraulic lift and crib for handling knocked-down locomotives. The War Department, it is reported, will attempt to rebuild cranes purchased for its munition plants, and then dispose of them to the Railroad Administration. If this plan proves extensive and should be found feasible, crane builders would be busy with this work for some time. There has been little or no drop in prices as yet, and agents are unanimous that there is no ground for a reduction except in keeping with any decline in steel prices; but it is pointed out that precipitate action along these lines, even though isolated, might result in a more general trend toward price cuts not based on cost figures.

The Belcanto Co., New York, has been incorporated with a capital of $25,000 to manufacture talking machines. S. Davidson, 262 West Ninety-fourth Street; H. I. Perlin and A. Kling, 274 South Second Street, Brooklyn, are the incorporators.

The Johnson Shipbuilding & Dry Dock Co., 109 Broad Street, New York, has increased its capital to $3,000,000.

The Kill von Kull Realty Corporation, New York, recently incorporated with a capital of $250,000, is planning for the construction of a shipbuilding plant on Staten Island. Represented by Gilbert & Gilbert, attorneys, 43 Exchange Place, a site has been purchased along the Kill von Kull, between Port Richmond and Mariners Harbor. It is said that a few of the structures now on the property will be employed for certain buildings for the new plant, while a part of the land, now under water, will be reclaimed for shop and construction purposes.

The Terminal Machine Co., New York, has been incorporated with a capital of $30,000 to manufacture machinery. H. I. Segal, J. L. Litton and S. Hirschberg, 406 Broome Street, are the incorporators.

The International Printing Plate Co., New York, has been incorporated with a capital of $125,000 to manufacture metal printing plates and similar products. A. W. Dolbey, 754 Nostrand Avenue, Brooklyn; R. Hinds, 165 Broadway, New York; and M. E. Gray, East Orange, N. J., are the incorporators.

The Pennsylvania Railroad, Pennsylvania Terminal, New York, is having plans prepared for the erection of a new one-story boiler plant at its Sunnyside Yards, Long Island City.

The Tollner Electric Co., Brooklyn, has been incorporated with a capital of $15,000 to manufacture electric equipment. D. W. von Bremen, D. Christie, and J. D. Miller, 215 Montague Street, are the incorporators.

The W. B. Kellogg Co., Inc., 59 Maiden Lane, New York, manufacturing jeweler, has increased its capital from $10,000 to $100,000.

The Brooks Ostruk Co., 224 West Fifty-seventh Street, New York, manufacturer of automobile bodies, has leased the entire building at 225-27 West Sixty-sixth Street for expansion.

The Frederick Schreiber Woodworking Co., New York, associated with Goertz Brothers, Inc., 325 East Sixty-fourth Street, is having revised plans prepared for the construction of a new plant at Webster Avenue and Hancock Street, Long Island City, to cost about $30,000.

The Highland Rubber Corporation, New York, has been incorporated with a capital of $50,000 to manufacture rubber goods. D. D. Deutsch, C. L. and L. R. Eastman, 116 West Thirty-ninth Street, are the incorporators.

The Simplex Cloth Cutting Machine Co., Inc., New York, has been incorporated with a capital of $50,000 to manufacture electrically-operated cloth cutting machinery. M. Finkelstein, M. Zawistowski and N. Obedin, 1145 Longfellow Avenue, are the incorporators.

Announcement is made by the Ford Motor Co., Detroit, that its former Long Island City works on Jackson Avenue will be abandoned and that all assembling work for the Eastern district will be handled at the new plant now in course of completion at Kearny, N. J. The Long Island City works have been placed on the market for sale.

Edward C. Striffler, 591 Eleventh Avenue, New York, iron, steel and other metal products, has been incorporated under the name of Edward C. Striffler, Inc., with a capital of $125,000. E. C. and E. B. Striffler and S. O. Miller are the incorporators.

The Old Reliable Motor Truck Co., 527 Fifth Avenue, New York, has increased its capital from $200,000 to $300,000.

The Downey Shipbuilding Corporation, Arlington, Staten Island, is planning to continue the operation of its shipbuilding plant following the completion of Government orders and will specialize in the construction of steel freighters. The plant has a capacity of about 75,000 dead weight tons and it is proposed to increase this to about 120,000. Wallace Downey is president and manager.

The Accounting Machine Co., 156 Broadway, New York, has increased its capital from $100,000 to $300,000.

Wheelock, Lovejoy & Co., 23 Cliff Street, New York, have filed articles of incorporation under Massachusetts laws with a capital of $1,000,000 to manufacture steel and iron products.

The Interboro Iron & Steel Structural Co., New York, has been organized with a nominal capital of $5,000 to manufacture structural steel and iron products. L. Bass, A. J. Halprin, S. H. Ganz, 150 Nassau Street, are the incorporators.

The Mutual Lamp Mfg. Co., 21 East Houston Street, New York, has increased its capital to $75,000.

The Electric Scaling Co., New York, has been incorporated with a capital of $100,000 to operate a ship repair and scale cleaning plant. O. C. Olsen, G. Sunseth and P. Bauer, 1 Broadway, are the incorporators.

The Fletcher Electric Co., New York, has been incorporated with a capital of $24,000 to manufacture electrical specialties. J. C. Mills, J. M. Lyon and D. C. Keefe, 969 East Twenty-third Street, are the incorporators.

Plans have been completed for a new ten-story cold storage plant, to be erected by M. Groh's Sons, Inc., 238 West Twenty-eighth Street, New York, at 245-51 West Twenty-seventh Street, at an estimated cost of $250,000.

The Tip-It Co., Inc., New York, has been incorporated with a capital of $50,000 to manufacture high-speed tools and other specialties. J. V. Schmidt, H. B. Dunham and R. L. Johnson, 366 Wadsworth Avenue, are the incorporators.

The White Co., Grand Concourse and 187th Street, New York, manufacturer of automobiles, has acquired property at Long Island City in the Degon Terminal district, for the construction of a branch establishment, comprising a total area of about 120,000 sq. ft.

The Electric Brazing & Welding Machine Co., New York, has been incorporated with a nominal capital of $5,000 to manufacture welding and brazing machinery. J. M. Vincent, A. M. Sheard and E. M. Simon, 1228 Halsey Street, Brooklyn, are the incorporators.

The Duplex Tractor Co., Troy, N. Y., has been incorporated with a capital of $750,000 to manufacture tractors, etc. W. Pratt, H. R. Mosley and L. A. Robinson are the incorporators.

The Raritan River Railroad Co., South Amboy, N. J., has been granted permission to issue capital stock for $160,000 to be used in part for erecting a one-story engine house, boiler plant and machine shop at its local yards.

Owing to the cancellation of shell contracts, the International Arms & Fuze Co., Bloomfield, N. J., has arranged for immediate curtailment in operations with the expectation of completing all Government work early in January. The plant has been giving employment to almost 9000 persons, and about one-half of this number will be released before the close of the year. It is reported that following the completion of Government orders the plant will be utilized for the manufacture of automobiles and automobile parts. F. H. Crook is general superintendent.

The Kling Furniture Co., Mayville, N. Y., has completed plans for the construction of a new one-story plant, 65 x 500 ft., at Westfield, N. J., to cost $30,000.

The Bureau of Yards and Docks, Washington, has taken bids for the construction of several new buildings for the naval air station at Cape May, N. J., including a one-story machine shop, 50 x 100 ft., general works shop, 30 x 60 ft., seaplane hangar, 110 x 160 ft., and coal storage building, the latter estimated to cost $50,000.

The Crocker-Wheeler Co., Ampere, N. J., manufacturer of motors, generators, etc., has completed plans for a one-story addition, 40 x 55 ft., to its boiler room and power house, known as plant 8-A.

The Edison Lamp Works of the General Electric Co., Sussex Street, Harrison, N. J., is said to be contemplating the erection of a new plant on property recently acquired at Frelinghuysen and Evergreen avenues, Newark.

The Victory Tire & Rubber Co., Jersey City, N. J., has been incorporated with a capital of $300,000 to manufacture tires and other rubber goods. L. H. Gunther, C. V. Reilly and A. W. Britton, 28 Nassau Street, New York, are the incorporators.

The H. R. Worthington Pump Works, Harrison, N. J., is planning for the resumption of operations at its plant on a normal basis. The company has been operating its works for Government production. It is understood that the present working force will be maintained.

Fire, Dec. 17, destroyed the Wilson Building, Lawrence and Mechanic streets, Newark, N. J., occupied by a number of industrial concerns, with total loss estimated at $60,000. Among the companies with machinery and equipment damage are the American Art Metal Co., the Dual Welding Apparatus Co., the Neverbreak Comb Co., Felzenberg Brothers, manufacturers of electric and gas fixtures, and Edward O. Chase, manufacturer of fine machinery.

The Niagara-French Battery Co., 161 Ogden Street, Newark, has been incorporated with a capital of $125,000 to manufacture electric batteries and similar apparatus. Raymond E. Cook, 419 West 115th Street; Ransom Noble, 204 West Seventy-seventh Street, New York; and Herbert M. Lloyd, Montclair, N. J., are the incorporators.

Buffalo

BUFFALO, Dec. 23.

Effective early in 1919, the Curtiss Aeroplane & Motor Co., Buffalo, will centralize all operations at the Churchill Street works. The Elmwood Avenue plant will be operated partially for the completion of flying boat contracts with the Government. It is reported that following the finishing of this work the plant will be sold. The buildings are partially the property of the company and the Government.

The Buffalo Structural Concrete Corporation, Buffalo, has been incorporated with a capital of $25,000 by F. H. Alt, C. V. Carney and A. C. Calder, Buffalo.

The Titan Furnace Co., Buffalo, has been incorporated with a capital of $10,000 to manufacture furnaces. G. S. Keil, M. W. Comstock and F. F. Williams are the incorporators.

The Allen-Fleming Machine Works, Buffalo, has been incorporated with a capital of $8,000 to manufacture machinery and machine parts. R. J. and A. Fleming and W. H. Allen, Buffalo, are the incorporators.

The Buffalo Slag Co., Ellicott Square, Buffalo, is considering the erection of a new one-story crusher plant, 70 x 100 ft., to cost $12,000.

The Cutler Desk Co., 20 Churchill Street, Buffalo, has increased its capital from $250,000 to $550,000.

The A. C. G. Life Savers Mfg. Co., Buffalo, has been incorporated with a capital of $75,000 to manufacture automatic control life saving devices. L. Calagrese, A. Geraci and P. Sactomagno are the incorporators.

The American Container Co., Buffalo, has been incorporated with a capital of $200,000 to manufacture containers. J. L. Heider, G. LeSueur and F. M. Fisher, Buffalo, are the incorporators.

The Arrow Point Auto Supply Co., Syracuse, N. Y., has been incorporated with a capital of $25,000 to manufacture automobile parts, supplies, etc. G. M. Blackman, G. E. Scherrer and J. M. Griswold are the incorporators.

The Batavia Steel Products Corporation, Batavia, N. Y., heretofore manufacturing 75 mm. shells for the Government, has been closed. About 900 persons are affected.

The Allen-Fleming Machine Works, Buffalo, N. Y., has been incorporated to manufacture special machinery and automobile parts. The new company has located its factory at 171-175 Ellicott Street. William H. Allen, R. J. Fleming and A. Fleming are the directors.

The Buffalo German Rock, Asphalt & Cement Co., 1100 D. S. Morgan Building, Buffalo, will, in addition to rebuilding its stone crushing and asphalt compounding plant at Kensington Avenue, Trinidad Street and the New York Central Railroad Belt Line, erect a two-story machine shop on the site for making and repairing machinery parts. Plans are being drawn.

The Standard Oil Co. has let contract for a pump and boiler house, 36 x 50 ft., which it will erect on North Beech Street, Syracuse, N. Y.

Bids will soon be received by W. W. Wotherspoon, State Superintendent of Public Works, Albany, N. Y., for installing lighting, power and battery charging equipment for the New York State Barge Canal terminal, Erie Basin, Buffalo.

The Hydraulic Power Co., Niagara Falls, N. Y., will make extensive improvements to its plant within the next few months.

The Amsterdam Drop Forging Co., Amsterdam, N. Y., D. W. Shuler, manager, is in the market for tongs for handling square steel.

New England

BOSTON, Dec. 23.

Some orders placed for automobile parts are already showing a welcome and promising disposition of that branch of American industries to pick up early in the new year the manufacturing lines laid aside temporarily for war work. How far this is common among automobile builders it is as yet too soon to even indulge in prophecy. Here and there manufacturers are found to be perfecting devices quite different to their pre-war output. These developments should show in the near future a demand for new equipment to handle the lately projected lines of work. While this may not be large the additional requirements will help along a lagging market. In this direction there are the further expectations that the severity of much unskilled operation as well as the very unusual pressure on machine tools made even by the skillful will result in much equipment being scrapped and replaced.

A factory addition is being built at Weymouth, Mass., for the George E. Keith Co., Campbell, Mass.

About $7,000 is being expended on remodeling a building for manufacturing purposes by the Cabel Mfg. Co. at Roxbury, Boston.

A storage yard with an overhead crane and other improvements is planned for the arsenal at Watertown, Mass. About $10,600 is involved.

Contract for a marine railroad has been let by the United States Shipping Board for installation at Field's Point, Providence, R. I.

Additions to cost about $10,000, one-story, 128 x 128 ft., are about to start at the factory of the Ellison Construction Co., Hartford, Conn.

Plans have been drawn for a factory building for the Jewel Belting Co., Hartford, Conn.

A foundry extension, one-story, 50 x 120 ft., is in progress at the plant of the Pratt & Whitney Co., Hartford, Conn.

A one-story power plant, 50 x 50 ft., is under construction for the Hunt & Rankin Leather Co., Peabody, Mass.

Work has begun on the automobile factory, one story, 600 x 200 ft., at Natick, Mass., for the Northway Motors Corporation.

Joseph Garneau has started the erection of a wood-working plant, two stories, 44 x 96 ft., at Gardner, Mass.

The Metal Specialties Co., Waterbury, Conn., has let contract for a one-story office building, 40 x 40 ft., and shop 30 x 60 ft., to cost $14,000.

Philadelphia

PHILADELPHIA, Dec. 23.

The Talbot Air Lift Co., 335 North Fourth Street, Philadelphia, has acquired a one-story factory at Nineteenth and Westmoreland streets for new works which will provide about 17,000 sq. ft. of manufacturing space.

The Midvale Steel & Ordnance Co., Widener Building, Philadelphia, will discontinue the manufacture of rifles at its Eddystone works on Jan. 11. It is understood that the greater part of the plant will be closed, a few employees being retained for the manufacture of spare parts, etc. The change will affect about 10,000 persons.

The Pennsylvania Railroad, Broad Street Station, Philadelphia, has arranged for the sale of a $50,000,000 bond issue, to be used for current obligations, extensions and betterments in all departments. During the past year the Railroad Administration authorized the company to make expenditures aggregating $113,656,000, with an allowance from such sum of $65,625,000 to be used for additions and improvements and $20,255,000 for the purchase of new equipment.

The Philadelphia Roll & Machine Co., Twenty-third and Carpenter streets, Philadelphia, manufacturer of steel castings, etc., will build a one-story addition to its foundry, 35 x 63 feet.

The Gem Stopper Co., Inc., 2120 Nicholas Avenue, Philadelphia, manufacturer of wire products, will rebuild its two-story plant, 66 x 86 ft., recently damaged by fire, at a cost of $10,000.

Effective early in January, a survey will be made by the Emergency Fleet Corporation, Philadelphia, of the Hog Island plant to determine its exact status as a shipbuilding yard and the desirability for the Government to purchase the works and operate them. The total expenditures made to date aggregate $58,000,000 and it is estimated that the plant will be complete in about two months. The American International Shipbuilding Corporation, operating the yard, has a contract with the Shipping Board for 180 vessels, costing about $256,000,000. The fees to the company will total about $9,000,000, or a little more than 2 per cent on the cost of production. Up to the present time 50 keels have been laid and one vessel delivered.

The Government is planning for the construction of the largest airplanes ever attempted at its League Island Navy Yard, Philadelphia. The general plans, it is understood, are now under way. Commander F. G. Coburn is manager of the local navy airplane factories.

The Ajax Rubber Co., Breunig Avenue, Trenton, N. J., has approved a stock issue of $1,000,000 to be used for general expansion.

Effective Jan. 1, the Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., will resume operations on a normal basis, operating one shift daily. It is understood that the Government has canceled an order for 800,000 shells, but has other work on hand to keep the plant operating until April 1. It is giving employment to about 700 persons and those

affected by the elimination of the extra shift will be taken care of where possible in other departments.

The Pennsylvania Railroad Co., Philadelphia, has commenced the erection of a new machine shop at Enola, Pa. Construction will soon be commenced on the new engine house and shop buildings to be erected at Marietta, at a cost of about $500,000. Plans are being drawn for the construction of an addition to its engine house at Hollidaysburg, Pa.

Baltimore

BALTIMORE, Dec. 23.

The City Spring Works, Park Avenue and Preston Street, Baltimore, will install additional motors.

A. Wilford & Co., 1425 Haubert Street, Baltimore, millwright and machinist, will install additional motors.

The Magneto & Machine Co., 1031 Cathedral Street, Baltimore, will build a machine shop, 22 x 55 ft. Charles M. Knock is president.

C. L. McIntosh, 618 Henry Street, Roanoke, Va., wants prices on machinery for the manufacture of fine cabinets.

The Franklin Soapstone Products Corporation, Roanoke, Va., wants prices on 40-hp. engines.

The Lumberton Fiber Co., Lumberton, N. C., plans the completion of a fiber mill and will install electrical machinery. F. M. Huggins is manager.

Prices on rail-straightening machines are sought by the Southern Iron & Metal Co., Jacksonville, Fla.

The Hodges Boiler Works, Mobile, Ala., plans to rebuild the plant recently destroyed by fire.

The American Mfg. Co. of Maryland, Baltimore, has been incorporated in Delaware with capital of $250,000 to manufacture machinery, parts, etc. James K. Lary, Samuel C. P. Hillbrook and M. A. Lary, Baltimore, are the incorporators.

The Spedden Shipbuilding Co., Kenwood Avenue, Baltimore, is planning for the immediate rebuilding of the portion of its shipbuilding plant recently destroyed by fire with reported loss of about $200,000.

The Renew Electric Lamp Co., Inc., Wilmington, Del., has been incorporated with a capital of $100,000 to manufacture lamps. A. M. Fox, Charles R. Bishop and S. H. Bayard, Jr., Wilmington, are the incorporators.

The Scott Fertilizer Co., Elkton, Md., is planning for the rebuilding of its plant, recently destroyed by fire, with loss, including machinery and equipment, estimated at $250,000.

The Tidewater Foundry Co., Norfolk, Va., has been incorporated with a nominal capital of $5,000 to manufacture castings. C. L. Hughes and O. L. Keeter, South Norfolk, are the principal incorporators.

The power plant of the Navy Department at the naval operating base, Hampton Roads, Va., was destroyed by fire, Dec. 10, with loss reported at $50,000. It is understood that the plant will be immediately rebuilt.

The War Department, Washington, has ordered construction stopped on the proposed new machine and welding instruction school at Camp Jessup, near Atlanta, Ga.

The Foundation Co., 233 Broadway, New York, has commenced the construction of a new electric power plant at its shipbuilding plant at Savannah, Ga. The local plant is building all-steel vessels of trawler type for the French Government. Following the completion of this order, it is proposed to continue the operation of the works for the construction of steel vessels for private interests. The plant is now giving employment to about 3000 men, and it is expected to increase this number to 4000.

The Chamberlain-Garner Co., Denton, N. C., has been incorporated with a capital of $100,000 to manufacture fireless cookers and other metal products. J. O. Garner, J. W. Cudato and J. W. Snider are the incorporators.

The United Motor Co., Tampa, Fla., has been incorporated with a capital of $25,000 to manufacture auto parts, etc. Manuel and Ramon Moran, and W. C. Moore are the incorporators.

Pittsburgh

PITTSBURGH, Dec. 23.

E. C. Beetem & Son, Carlisle, Pa., are considering plans for the erection of a one-story power plant, 50 x 70 ft., at their carpet works, to cost about $50,000.

The Gearless Motor Car Co., West Homestead, Pa., has been incorporated in Delaware with a capital of $50,000 to manufacture gearless, steam-driven automobiles. D. and E. M. MacDonald and Victor Schrobaz are the incorporators.

The Pittsburgh Coal Co., Oliver Building, Pittsburgh, is building a new one-story machine shop, about 102 x 103 ft., at Library, Pa. A portion of the structure will be used for storage purposes. With a one-story office building of like size, the shop will cost about $50,000.

The War Department, Washington, is planning to carry out its proposed project for a large gun manufacturing plant at Neville Island, and it will be equipped to manufacture guns of all calibres, including forgings used for production. It will also manufacture rifles.

The Montour Railroad Co., Pittsburgh, has acquired about 25 acres at Coraopolis for a consideration of $65,000. A portion of the site will be used for the construction of a new car manufacturing plant, including shops, wheel works and other structures.

The Wheeling Machine & Welding Co., Wheeling, W. Va., has been incorporated with a capital of $25,000 for the manufacture of machinery and parts. William J. Braddock, John A. Moore and Joseph W. Milard are the incorporators.

The H. T. Lambert Co., First National Bank Building, Huntington, W. Va., has purchased buildings and plants to install equipment for the manufacture of mine cars. Prices are wanted on punches, drills, shears, etc.

Chicago

CHICAGO, Dec. 23.

The metal-working machinery trade is quiet and is expected to remain so for a few weeks. Of course, there are some inquiries and a sale is made here and there, but the sum of business is not large. Some of those who contemplate the purchase of tools undoubtedly believe that by waiting they will be able to buy at lower prices, but the statements of builders and their representatives do not indicate that this will be the case. The sellers do not look for any reduction in the next six months. They emphasize that most of the materials to be used in their output for some months has been contracted for at maximum Government prices, therefore material costs will not be lower. In pig iron, for instance, foundries are quite generally covered for the first quarter, and in many cases for the first half, all at the full Government price, and the pig-iron producers insist they will accept no cancellations. Labor is high, and with the cost of living where it is, there is no general disposition to take the first step in lowering wages, much as it is admitted that lower labor costs must eventually prevail.

If the reductions in iron and steel prices, recently announced as applying to new business, are pointed to as an argument for a reduction in machine-tool prices, a counter-argument is that even should some of this lower prices material enter tools, it is but a small factor in the production cost as compared with that of labor. In some tools the labor cost amounts to at least 70 per cent.

Nothing further is reported as to what progress has been made in the plan of having the Government spread its disposal of machine tools over a period of three or four years, on the basis of the tool builder selling a machine where the Government sells one. It is known, however, that the dealers are not so favorably disposed toward the plan, for the reason they have been looking forward to picking up numerous bargains, and the opportunity will not come if the Government co-operates with the machine-tool industry in preventing the market from becoming flooded with machines originally intended for war work. The builders assert themselves to be entitled to primary consideration because they are employers of labor, and not only they, but the Government, are desirous of keeping labor employed and manufacturing organizations intact.

Much to the surprise of a Kenosha company manufacturing adapters, in making which it has reached high production, the Ordnance Department, Dec. 18, telegraphed the company to stop work, and did this despite previous assurances that the company should operate until Jan. 1. With the latter date in view the work on various operations was scheduled so that it would run out in a manner which would leave no unfinished parts. The workmen had been informed as to how long there was work in view for them and the sudden order was disconcerting.

The Stewart Mfg. Co., Grand Forks, N. D., has been incorporated with a capital stock of $300,000 for the manufacture of automobile radiators and other specialties. Among the incorporators are N. J. Stewart and J. J. McGuire of Grand Forks and F. G. Rodenack of Minneapolis. A plant is being sought; meanwhile the company has temporary offices at 410 De Mers Avenue, Grand Forks.

The Royal Mfg. & Foundry Co., Oshkosh, Wis., has been organized with a capital stock of $30,000 to take over the business of the Schloemer Mfg. Co. of that place. The business of the company is foundry, welding and metal specialty work. Frank Clark, 388 Division Street, is president.

Milwaukee

MILWAUKEE, WIS., Dec. 23.

Machine tool manufacturers are booking a fair number of new orders, although on the whole business is quiet and probably will not show any real life until after the holidays. The volume of inquiries coming in is the subject of comment among the manufacturers and dealers. Production on old orders is proceeding at a good level, and while the high pressure of recent months has been relieved, requirements are such that it is necessary to maintain full output.

The Philip Schwab Co., Sixteenth and Canal streets, Milwaukee, sustained an estimated loss of from $30,000 to $35,000 by fire, Dec. 17, in the main building of its machine and heavy forge works in the Menomonee valley. The buildings will be replaced at once, with most of the equipment. Philip Schwab is president and manager.

The Turner Mfg. Co., Port Washington, Wis., has taken an order for several hundred farm tractors for export to Italy.

The Milwaukee assembling plant of the Ford Motor Co., Prospect Avenue and Kenilworth Place, will resume operations on a limited scale on Jan. 2, and about April 1 will begin assembling cars and trucks at about 150 a day. The plant was commandeered by the Government for hospital purposes, but was returned to the company several weeks ago. A. W. L. Gilpin is general manager of the Milwaukee branch.

George W. Nelson, who formerly conducted a brass foundry at Cumming Avenue and Second Street, Superior, Wis., has re-entered the business and has opened a shop in the former plant of the Acme Foundry Co.

The Fina & Pichler Co., Milwaukee, has been incorporated with a capital stock of $30,000. The corporation succeeds the partnership conducted under the same style by Val Fina and Joseph Pichler at 128-132 Ferry Street. Tools, dies, jigs and mechanical appliances are manufactured.

The Cudahy Brothers Co., meat packer, Cudahy, Wis., has awarded the general contract to the William F. Tubesing Co., 139 Chestnut Street, Wauwatosa, for the construction of a four-story reinforced concrete, steel and brick cold storage warehouse, 80 x 200 ft., costing about $150,000.

The Maibohm Motors Co., Racine, Wis., is making plans for replacing its plant, almost totally destroyed by fire on Dec. 3, with a new main shop, 75 x 500 ft., one story, of steel and brick. The building will cost about $90,000. H. C. Maibohm is president and general manager.

The Gehl Brothers Mfg. Co., West Bend, Wis., manufacturer of gas engines, tractors and farm machinery, is increasing its machine shop floor space by taking over that formerly occupied by the offices. A second story has been added to the erecting shop for offices. A small list of new tools will be installed.

The Gillette Tire Co., Eau Claire, Wis., has awarded contracts for the erection of a brick addition, 40 x 125 ft., to provide space for the motor truck solid tire manufacturing department recently established. R. B. Gillette is vice-president and general manager.

The R. B. Lang Mfg. Co., Racine, Wis., has started work on rebuilding its main shop, recently damaged by fire. Some of the equipment will be replaced. The company makes hardware specialties, metal stampings, and does work in plating and welding.

The Northern Foundry Co., Marinette, Wis., at its annual meeting decided to increase the capital stock from $25,000 to $35,000 to cover the cost of improvements and enlargements now being completed and provide funds for enlarged operations. The capacity has been increased about 75 per cent. The company manufactures gray iron castings and specializes in automotive and agricultural machinery parts. The officers are: President, J. M. Fitzpatrick, Marinette; vice-president, Patrick McManus, Milwaukee; secretary, Edward J. Vanderboom, Milwaukee; treasurer, Louis E. Best, Milwaukee. Mr. Fitzpatrick is general manager.

The Chippewa Power Co., Eau Claire, Wis., has been incorporated with a capital stock of $200,000 by P. D. Kline, Donald Boyd and V. S. Hillyer. The company will develop a water power site on the Chippewa River and plans to build a hydroelectric plant north of Eau Claire.

The Landover Truck Co., Marinette, Wis., has moved its motor truck manufacturing plant to the former Place shops at Stephenson and Liberty streets. The space vacated has been taken over by the Northern Foundry Co., Marinette.

The Dells Paper & Pulp Co., Eau Claire, Wis., has awarded the general contract to A. Larson & Co., 414 Main Street, for the construction of a new paper mill and power plant costing $125,000. The plant was designed by L. A. DeGuere, consulting engineer, Grand Rapids, Wis., who is purchasing the paper mill and hydroelectric equipment. W. L. Davis, Sr., is president.

The Vollrath Co., Sheboygan, Wis., manufacturer of enameled sanitary and kitchen ware, has engaged Brust & Philipp, architects, 506 Free Press Building, Milwaukee, to prepare tentative plans and sketches for extensions to its works. Details are not available.

Detroit

DETROIT, Dec. 23.

The Government is continuing to place large orders in this district. Cancellations, except in the aircraft division, have been few. Industrial concerns which have been on a 95 per cent war basis are attempting to get back on regular work, but in many cases the re-conversion is being accomplished slowly. As a result the purchase of machine tools has not increased as rapidly as expected. The market is about normal, with an increasing number of inquiries. Deliveries have bettered, particularly on standard tools. A New England manufacturer of internal gear shafting machines has sold 75 machines to local automobile manufacturers in the last week or two.

The labor situation is well in hand and no difficulty is expected in placing returned soldiers. Employers have gone on record as being willing to take back their men.

The Studebaker Corporation, Detroit and South Bend, Ind., is rapidly getting back into the production of passenger cars. Orders on hand will take the entire output to the end of March, by which time the company is expected to be back on quantity production. So far none of its ordnance contracts have been canceled.

The American Steam Pump Co., Battle Creek, has informed the Chicago office of the Emergency Fleet Corporation, in answer to an inquiry, that it is in a position to make 2500 steam pumps for the Government. The corporation's requirements will be 27,000 power pumps instead of 20,000, as recently announced.

An agreement was signed between the City Council, Chatham, Ont., and the Denby Motor Truck Co., Detroit, calling for the erection of a $20,000 plant. The company has just been incorporated in Canada with a capital stock of $200,000.

It is reported that the Republic Motor Truck Co., Alma, Mich., will erect a plant, probably in Toronto, where about 5000 trucks will be assembled for the Canadian trade.

The H. J. Hartman Foundry Co., Grand Rapids, whose plant was partially destroyed by fire about two months ago, has been rebuilt and consists of a new building, 45 x 90 ft., core room and casting room, a machine pattern shop, 40 x 60 ft., and other buildings. In the main building are seven large cranes and eight new model molding machines. Three coreovens, one for night and two for day work, are located in a 22 x 150-ft. daylight coreroom. The products of the company are machine, tool and general gray iron castings. The officers are: Henry Hartman, president; John Link, vice-president and general superintendent; and Earl Rogers, foundry superintendent.

The Manhattan Machine & Tool Works, Grand Rapids, has filed its articles of association. Its capital stock is $100,000, of which $64,925 has been subscribed and paid in. The stockholders are: F. J. Jarecki, Leon Nadolski, P. J. Jarecki, L. W. Smith, and Agnes Shilliday.

A. J. Detlaff Co., Detroit, will hereafter confine itself to the production of clutches and control sets, which have formed a large proportion of its output since its organization in 1903.

The Howell Electric Motors Co., Howell, manufacturer of Howell alternating current polyphase induction motors, has increased its capital stock from $150,000 to $200,000.

The Michigan Press Co., Ypsilanti, has changed its name to the Michigan Machine, Tool & Foundry Co., and increased its capital stock from $100,000 to $300,000. Plans are said to have been perfected to expand its manufacturing facilities.

The Anderson Forge & Machine Co., Detroit, which was organized several years ago with a capital stock of $400,000, has increased its capital to $700,000. The expansion of its manufacturing facilities has been under consideration for some time.

It is reported that the General Motors Co. is contemplating the erection of a plant in Detroit to manufacture electric lighting and starting systems and that it is also making plans for producing a light low-priced truck.

The Jaxon Steel Products Co., Jackson, Mich., which was producing 27,000 rims and rim parts before the war, has returned to normal production and expects to increase its output.

Cleveland

CLEVELAND, Dec. 23.

Machine-tools inquiries are coming out in better volume than in the past few weeks, but orders are still scarce. It is believed that consumers are holding back because of an expectation that prices will go lower. There are no indications, however, of any price reductions and the feeling is quite general in the trade that prices will remain the same for the next six months. The Burroughs Adding Machine Co., Detroit, is in the market for about 100 tools, mostly screw machines, and there are a number of other scattered inquiries in lots up to 8 or 10. Some machine-tool equipment is being purchased for naval ordnance work in Dayton, Ohio, and an inquiry is pending for six heat treating furnaces for the same purpose. New demand for screw machines has come from manufacturers of plumbers' brass goods.

Several local machine-tool manufacturers have reduced their working day to eight hours and are eliminating overtime pay. One of the questions that confronts machine-tool manufacturers is to what extent it will be advisable to manufacture machinery for stock. At present the cost of building machinery is practically the same as during the war and manufacturers do not care to stock up with a large amount of machines that they possibly may be able to build later at lower costs.

The plan for placing the large amount of Government machinery on the market that was brought before the machine tool convention in New York appears to be generally approved by both manufacturers and dealers in this section. So far little second-hand machinery owned directly by manufacturers and used in war work has been placed on the market.

Large orders for parts of heavy artiliery that have taken much of the capacity of a number of northern Ohio plants for some time were canceled by the Ordnance Department the past week.

The Cleveland Milling Machine Co., Cleveland, has completed a three-story addition of steel and concrete, which will provide 42,000 sq. ft. of floor space, and will be devoted exclusively to the manufacture of milling cutters. The remainder of the plant will be used entirely for the manufacture of milling machines and other products. A new two-story office building is also nearing completion. This company will shortly bring out a No. 1 and No. 3 plain universal and vertical milling machine. At present it is making only plain universal machines in one size.

The Canton Foundry & Machine Co., Canton, Ohio, which has been manufacturing portable cranes, alligator machines and industrial turntables on a 100 per cent basis for Government requirements, is now manufacturing the same lines for the commercial trade. The only product which was discontinued during the war was automobile turntables, the manufacture of which will be resumed as soon as material is available. The company reports that it will go after the foreign trade very extensively.

The Toledo Machine & Tool Co., Toledo, Ohio added a great deal of new equipment to take care of war-time production and now will greatly increase its commercial production and is planning to build considerably larger machines than heretofore. The company has been devoting practically its entire capacity to building presses, dies and similar sheet metal-working machinery for the Government, which were used for the manufacture of shells, brass cases, airplane, truck, gun, automobile and tractor parts, mines, field kitchens, gas masks and other war material. The company some time ago purchased a 100-acre site for a new plant to take care of its future requirements.

The American Forge & Machine Co., Canton, Ohio, which was largely engaged during the war on the manufacture of heavy forgings, has resumed its regular line of work, which includes the manufacture of drop and drawn forgings. In order to take care of Government work the company added a heat treating department which will now be used for its regular products. It also has a well-equipped machine shop in connection with its forging departments.

The Wright Mfg. Co., Lisbon, Ohio, is enlarging its plant by the addition of a two-story machine-shop, 80 x 100 ft., and is purchasing considerable new equipment. The company reports that the demand for its line of hoists and trolleys has been abnormally heavy the past three years and that recently it has been possible to accept only orders bearing high priority rating for urgent war work. As a result of this demand it states that dealers' stocks, both in this country and abroad, are very low, and it will take months to replace them.

The Woods Engineering Co., Alliance, Ohio, which was largely engaged on the manufacture of machine tools for the Government during the war, will utilize this additional equipment in increasing its production of universal tool and cutter grinders.

The Bunting Brass & Bronze Co., Toledo, Ohio, added some new equipment during the war for the manufacture of bearing bronze and it is now considering placing on the market a new line of products.

It is announced from Findlay, Ohio, that the plant of the Grant Motor Car Corporation, which has been making shells, will discontinue that line of manufacture after Jan. 31.

The American Welding & Repair Co., Akron, Ohio, is a new company which will establish a plant at 517 South Main Street to do acetylene and electric welding.

Cincinnati

CINCINNATI, Dec. 23.

Cancellation orders on machine tools are more numerous, but no definite action has yet been taken on accepting them. Machine-tool builders who attended the convention in New York last week are rather non-committal as to what action will be taken, but the general opinion is that the Government is doing everything possible to adjust the very difficult situation. While it is known that approximately $300,000,000 worth of machine tools will have to be disposed of by the Government, the fact is at times overlooked that about $100,000,000 of this is represented in special machines that would be of little value in ordinary shops. It has also been pointed out that a large number of standard machines that will come back on the market have seen hard usage and will probably not be of much service. Offsetting this is quite a number of machines now under construction.

Manufacturers of portable electric drilling and grinding machines report a very encouraging export inquiry, and one local firm last week received an order from the Philippine Islands for 12 of its standard drilling machines. Activities with jobbing foundries are slowing down, as they are getting many cancellations covering machine tool castings and are practically receiving no new business of this character.

The local labor situation has been taken care of fairly well in spite of the slowing down in operations. There is plenty of unskilled labor to be had, but so far not an oversupply of skilled help. At Hamilton, Ohio, machinists who made demands a fortnight past walked out of one shop, but the other two plants involved are still operating.

It is reported that the former plant of the R. K. LeBlond Machine Tool Co., in Linwood, will be used by the Government for the storing of machinery. This plant had been equipped for the manufacture of small arms.

The Parks Ball Bearing Machine Co., Cincinnati, has been incorporated with $50,000 capital stock by E. E. Baker, John H. Ruthmeyer, and others. The company operates the plant at Northside for the manufacture of special wood-working machinery. Very little new equipment will be required.

It is reported that the United States Cast Iron Pipe & Foundry Co., Addyston, Ohio, contemplates extensive improvements to its plant. Details are not yet available.

The Hamilton Welding Co., Hamilton, Ohio, has purchased the plant formerly occupied by the National Castor Co. and will move into its new quarters at an early date. Robert H. Kemp is president.

The Constitution Stove Co., Marietta, Ohio, has purchased a site on which it expects to locate a plant for the manufacture of grindstones.

The Ironton Engine Co., Ironton, Ohio, is installing additional equipment in its foundry department that will practically double its present output.

Government Purchases

WASHINGTON, Dec. 23.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, at an early date under schedules as follows: Schedule 3593, Eastern and Western yards, miscellaneous chain hoists; 3594, Eastern and Western yards, hydraulic jacks; 7514½, for Washington, 1 bench lathe; 7531½, for Washington, 6 slotter machines; 7542½, for Washington, 6 lapping machines; 7543½, for Washington, 2 die slotting machines; 7546½, for Newport, 1 engine lathe; 7548½, for Washington, 1 pipe threading and cutting machine; 7556½, for Washington, 1 molding machine, 4 bench swing saws and 29 wood trimmers; 7557½, f.o.b. works, 20 ventilating sets and 10 spares; 7561½, for South Charleston, 1 cupola and 1 air compressor; 7565½, for Charleston, 1 power double hammer; 7574½, for Washington, 1 pipe and bar bender, 1 metal sheet cutter and 1 spot welding machine; 7580½, for Mare Island, 1 arc welding machine; 7590½, for Washington, 1 hydraulic bundling press.

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